THE AEROPLANE and ASTRONAUTICS

JUNE 3, 1960

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15,000 feet above the Farnborough crowd, test pilot Bill Bedford threw the red Hunter two-seater trainer into a spin. Falling 10,000 feet in fifty seconds he corkscrewed 12, 13, 14 times — then regained perfect control.

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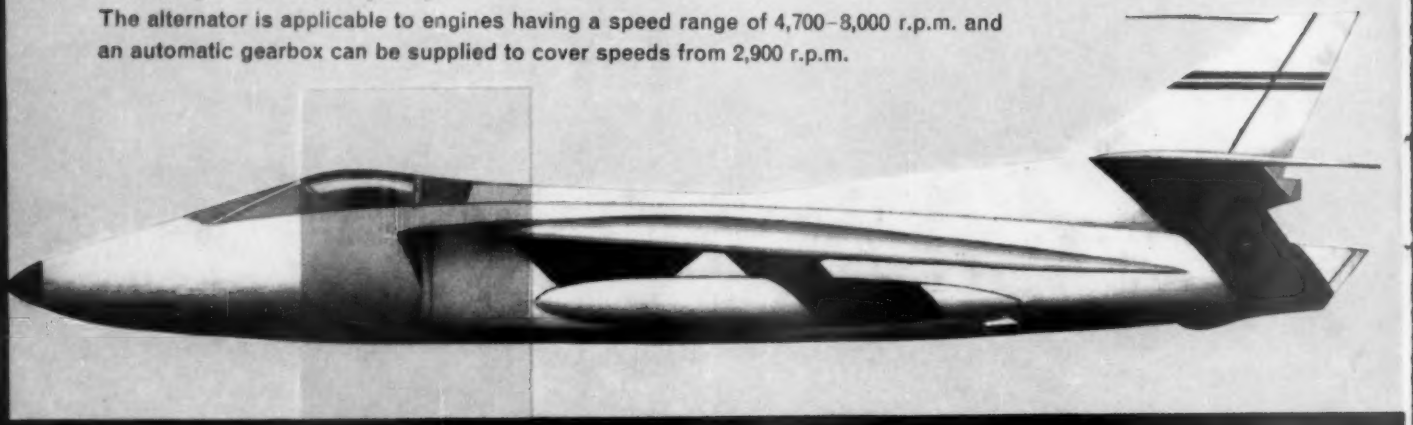

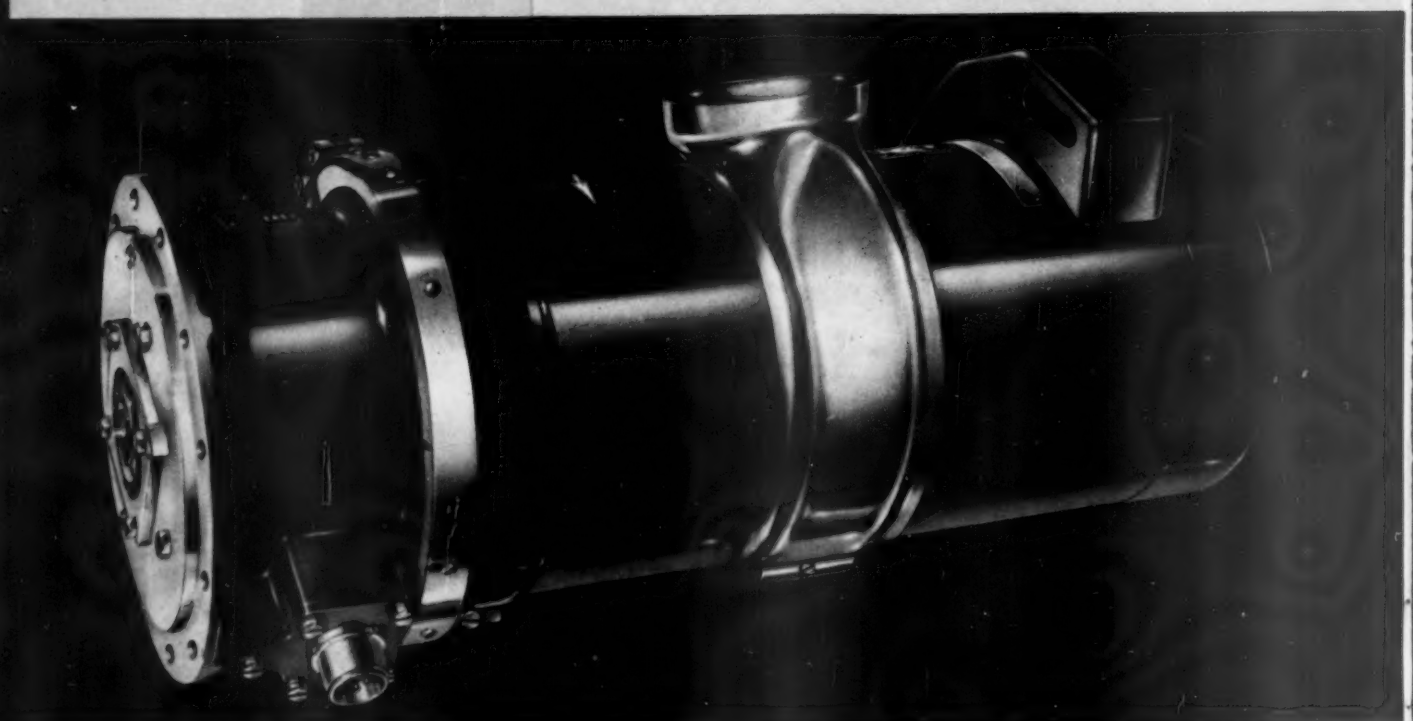

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Mr. R. M. Ansett, Chairman and Managing Director, Ansett Transport Industries Ltd., Australia.

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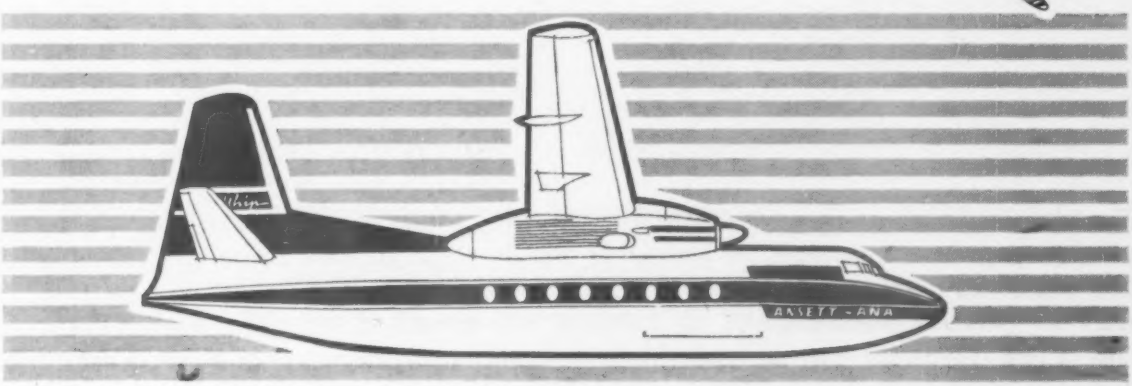
In 180,000 hours of smooth flying the Friendship has proved its excellent profit-earning capacity and operational reliability in regular airline service in four continents.



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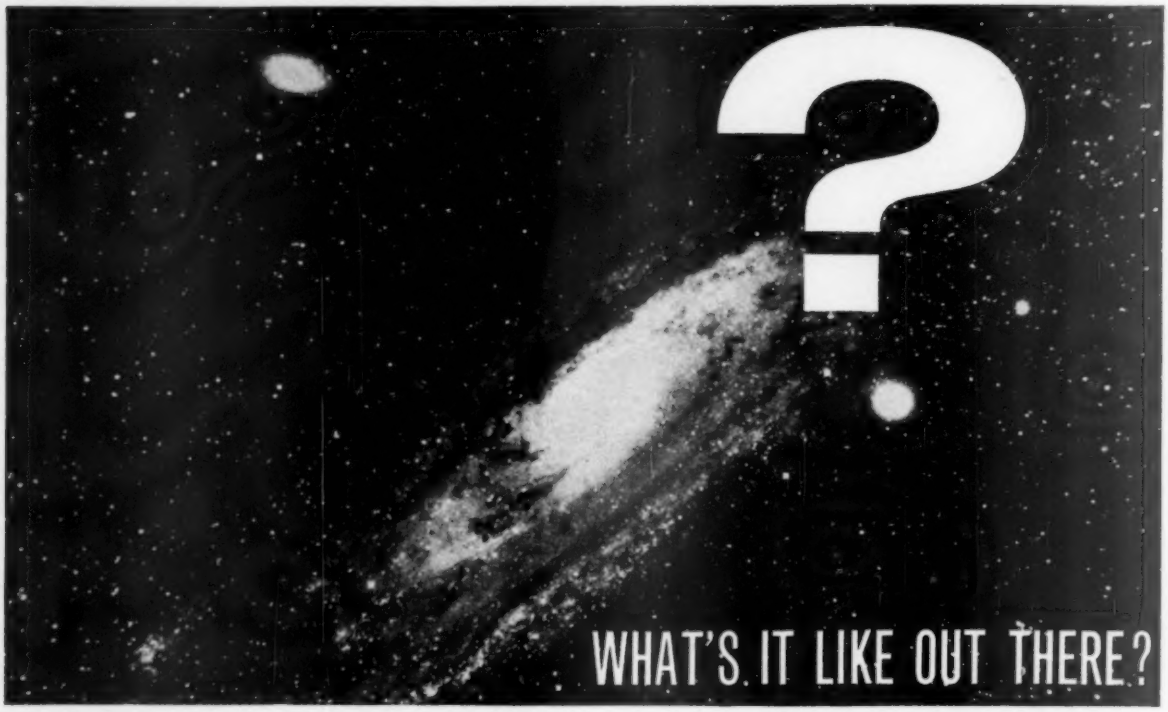

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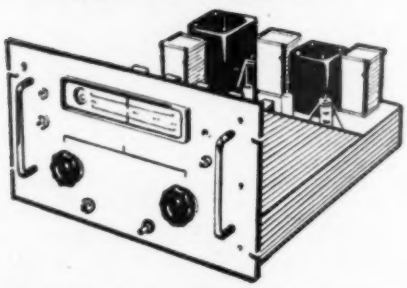

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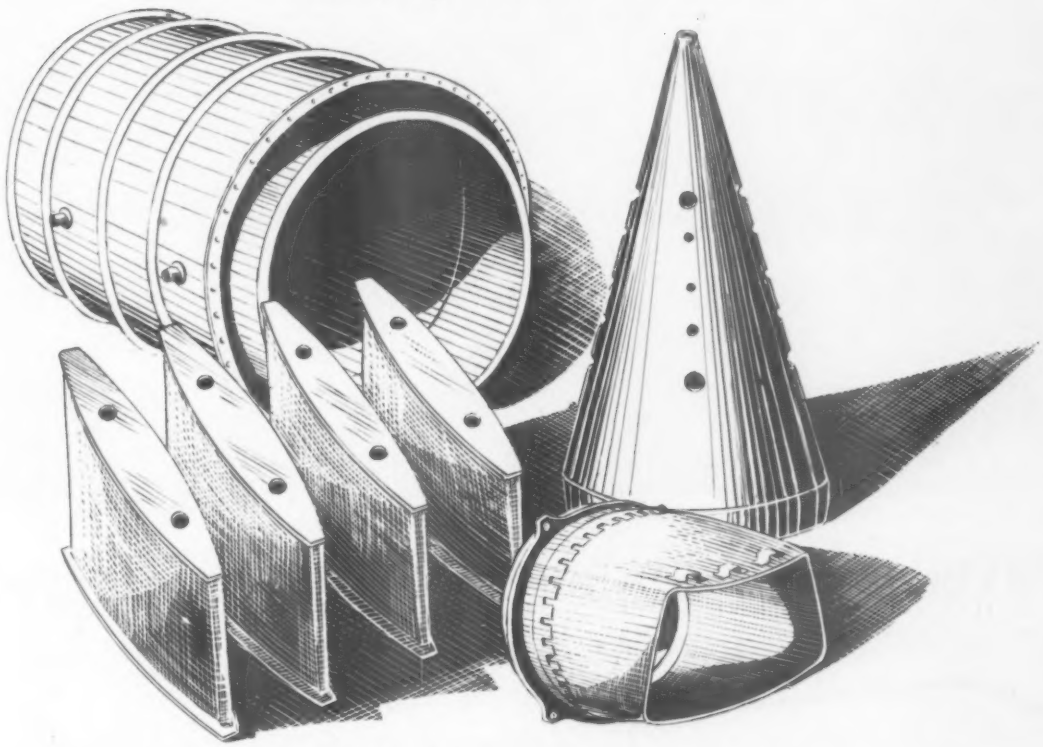

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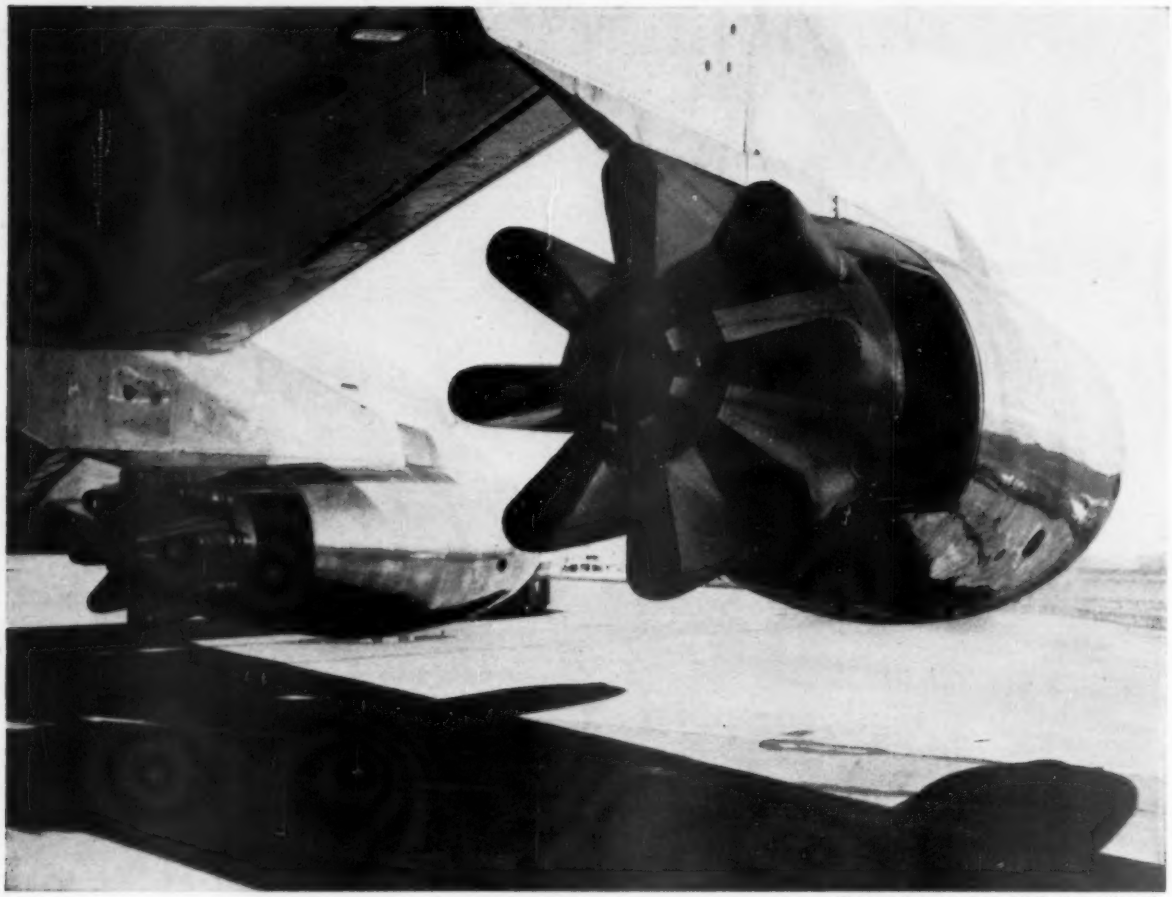

Photograph by courtesy of Rolls-Royce Limited.

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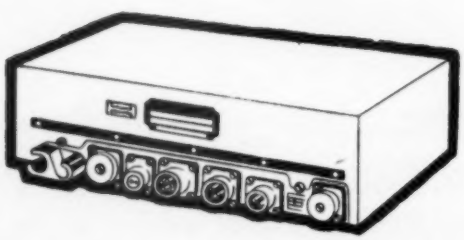

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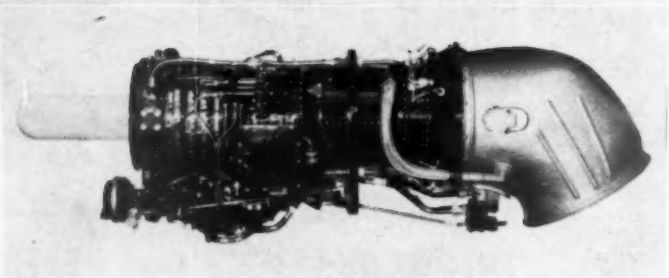

The de Havilland GNOME Turboshaft Unit.

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The ubiquitous Westland Whirlwind has now been ordered in quantity in its latest, turbine powered, version for the Royal Air Force. In addition a large number of piston engined Whirlwinds now in service are to be converted to turbine power.

Powered by a single de Havilland GNOME turbine engine, of 1000 s.h.p. it offers significant increases in performance, weight saving, engine life and operational readiness, as well as reducing vibration and noise.

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Recent development progress mean that this aircraft can be made available to civil and military operators powered by either:

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THE AEROPLANE and ASTRONAUTICS

VOLUME 98 NUMBER 2537 JUNE 3, 1960

Pay-on-the-Plane Services

The other day an attempt to book an airline seat from Edinburgh to London on a weekday afternoon disclosed that there were no seats available on that day by any B.E.A. service to London from either Edinburgh or Glasgow. It is true that we had been warned of this situation by other travellers, but remained unconvinced until we had put it to the proof since the day in question was just a normal middle-of-the-week day.

Far be it from us to berate B.E.A. for its well-deserved popularity. Nothing could be more satisfactory to a vigorous airline board than to be running at such high load factors. Moreover, as there is no competition, there is no concomitant worry of turning away travellers to a competitor.

Also, we hasten to add, this particular shortage is in no way, so far as we are aware, connected with the situation which has arisen over the Vanguard deliveries. It is just that the speed and comfort of turbine-engined air transport is at last properly appreciated by the conservative population of these islands. It seems to us that now is the time to make further benefits of air travel available on internal services.

However, it is only a week or so ago that we watched in the United States a Napier-engined feeder liner disembarking a nearly full load (42 out of 44) of passengers at Philadelphia. What made the scene of special interest was that the operator concerned, Allegheny Airlines, is running a Commuter Service whereby passengers save time and money.

As the figures show, which we have mentioned already, the operation of the service does not require that the aeroplanes shall be operated at low load factors. Indeed, it has been demonstrated that the reverse is the case.

From the passengers' point of view, provided he does get a seat on the service, the whole arrangement is particularly attractive. By not booking a seat in the normal way he saves $7 on a $20 fare. When a non-booked passenger arrives at the "gate" for the service, he obtains a card from the clerk which is punched in a time clock. As soon as the booked passengers have been let on board, the non-booked travellers are allowed on in order of the times on their stamped cards. In due course, once on board, a stewardess sells them a ticket. The only handicap is that there is no provision for handling baggage—any which non-booked travellers may have, they must carry themselves. But between Pittsburgh and Philadelphia this is not serious for most people.

We suppose that the bulk of travelling between London and Edinburgh and London and Glasgow is by people who are not making a long stay. For such people, surely, a commuter-type service would be of tremendous benefit.

Surely this practical demonstration, of what can be done with no-reservation airline travel, is worth the closest study for all U.K. internal services. In the British Isles most of the routes are so short that with medium high-speed aircraft meals in the air are a luxurious superfluity. By cutting these out overheads would be very considerably reduced. If at the same time the no-reservation system were introduced a further saving in costs would be possible. At this stage the problem remaining to be solved would be the provision of enough seating capacity.

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Matters of Moment

Farnborough Plans

TRANSITIONS to and from hovering flight by a Short SC.1 VTOL research aircraft promise to be a highlight of the 1960 S.B.A.C. Display, which will be held at the R.A.E., Farnborough, from Sept. 5 to 11. Other plans include an Army contribution to the Services' demonstration for the first time. It will probably take the form of a helicopter display, a drive-past of Army vehicles towing missiles on their launchers and a demonstration of launching procedures. For the R.A.F. it is expected that No. 111 Squadron will again demonstrate its World-renowned precision formation aerobatics with Hawker Hunters.

In the static exhibition there will be fewer stands for aircraft, missile and engine manufacturers—following mergers in the industry—but the floor area covered by these stands will be 8,000 sq. ft. greater. Equipment and material manufacturers will have about as many stands as last year, when there were 284. The areas of both the outside equipment display and guided weapons park have been increased.

Improvements are being made in the facilities and general appearance of the Display this year. They include a new road and footpath to the exhibition building, a new layout and extension of the exhibitors' restaurant and the provision of additional buffets close to the exhibition. A particularly welcome improvement is an additional road to the aerodrome that is to be provided to help the flow of traffic on the days the display is open to the public (Sept. 9-11).

Safety Versus Economics

AT the recent IATA Technical Conference the committee dealing with turbojet fuel problems regretfully came to the conclusion that, for economic reasons, it may be necessary in the future for airlines to use both kerosene and JP-4, or "wide-cut" fuel. The difficulties are understood well enough, but it will be a sad decision if more airlines are forced to use the more inflammable type of fuel.

The majority of carriers are at present using kerosene based on specifications worked out by IATA, but fluctuations in price and variations in local supply may eventually require the use of both types of fuel either separately, over different sectors, or together.

The IATA committee approved "guidance" material for JP-4 and kerosene specifications which will eventually permit improvements in overall economy on World-wide operations; fuel now accounts for about 15% of all airline costs and the proportion may soon reach 30%.

The suggestion was also made at the meeting that fuel deliveries should eventually be measured on a basis of B.Th.U. value rather than by volume, or even by weight.

Sir Matthew Slattery, whose name has been increasingly mentioned as the new whole-time chairman of B.O.A.C. to take over when Sir Gerard d'Erlanger resigns his part-time post in 1961.

Spaceship Still Functioning

DESPITE the orientation fault which caused the retro-rocket to push the Soviet satellite-spaceship into a higher orbit instead of starting it on a downward path, information is still being received from orbit. The "Signal" radio transmitter continues to function normally on the frequency of 19.995 Mc/s. and is sending data on the vehicle's internal temperature and pressure and the working of its instruments. Apparently, conditions suitable for human life continued to be maintained in the cabin at least until May 23.

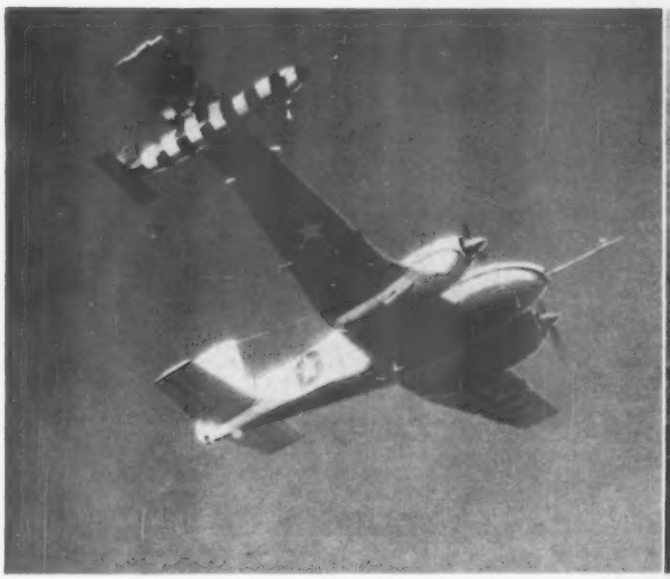
By 18.00 hrs. (Moscow time) on that day, the separated components of the space-vehicle had completed 134 circuits of the Earth, having travelled about 3,540,000 miles. They are moving along an orbit, at fairly close proximity, which Tass states to have an apogee of 429 miles and a perigee of just over 190 miles. The final stage of the carrier rocket continues along the original orbit. "Thus," says Moscow, "the satellite ship, the separated cabin and the last stage of the carrier rocket can now be tracked independently."

A Set-back for the Vanguard

THE grounding, on May 24, of all aircraft flying with Rolls-Royce Tyne engines seems to make inevitable a delay in the introduction into service of the Vickers Vanguard, which had been scheduled by B.E.A. for Jly. 1. This is by far the most serious result of the Rolls-Royce recommendation to halt Tyne flying, which also affects the Canadair CL-44 and one or two flying test-beds. The decision was taken after a Tyne compressor wheel had failed during bench testing and "confirmatory evidence" had been found in another compressor. A full technical investigation was immediately put in hand;

AMERICAN VISITOR.—Last week a Grumman Gulfstream executive aircraft arrived at Gatwick airport after a trans-atlantic crossing from Teterboro, New Jersey, for a European demonstration and sales tour. This was scheduled to end on Jne. 1 when the aircraft was to return to the U.S.A. The Gulfstream is powered by Rolls-Royce Dart turboprops.

EXTENDING THE RANGE



An unusual technique for extending aircraft range has been developed by the Beech Corpn. in America. Known as the range extension system and shown here fitted to a Beech L-23, it comprises wing-tip fuel-tanks complete with stub wings, empennage and alighting gear. These "free-flying" tanks form an extension to the parent aircraft's mainplane. The photograph, above left, indicates that the L-23 can be handled satisfactorily with only one such unit fitted.

Rolls-Royce is well equipped to tackle a crisis of this kind.

Eight Vanguards were affected by the grounding order, including the six 951s for B.E.A., the first 952 for T.C.A. and the Vickers-owned pre-production aircraft. We recorded the progress of flight trials with these aircraft in our issue for May 20, since when the test programme has been completed and the results submitted to the A.R.B. The granting of a full C. of A. for the Vanguard is thus likely to follow quickly upon the solving of the Tyne problem. Meanwhile, Vickers is continuing to bring the aircraft up to delivery standard for B.E.A., and the Corporation is going as far as possible towards accepting the aircraft in order to minimize formalities later.

B.E.A. had planned to introduce the Vanguard on the London-Paris route on Jly. 1, taking over completely from the Viscount on that route. The aircraft will be arranged as 110 seaters (26 first class, 84 economy) and bookings had already been made on this basis. The problem for B.E.A. is, therefore, to cover these services with additional aircraft chartered from other operators, at a time when the summer traffic is in full swing. If the Tyne problem proves to be easily resolved, deliveries of Vanguards to B.E.A. may still be possible before Jly. 1, but the first commitment will then be to train crews.

R.A.F.A. Continues the Good Work

HARROGATE was the scene of this year's Conference of the Royal Air Forces Association. Harrogate is a spa town in Yorkshire noted for its waters and its air, the latter at this time sweet and heavy with the scent of lime trees and lilac. It is a splendid place for a week-end conference; a town full of surprises—it has, for instance, four Chinese restaurants and a shop full of exquisite Oriental carpets.

In the absence of Lord Tedder, the Conference was presided over by Air Marshal Sir Robert Saundby (well known to readers of THE AEROPLANE AND ASTRONAUTICS for his articles on air strategy). Harrogate's Mayor, Councillor L. ROBERTS, in his opening speech of welcome echoed everybody's thoughts in regretting that the Association's president could not be present, and wished him a speedy recovery. He ended his address: "Your work for the welfare of those who devoted their lives to the service of their country must appeal to us all."

The agenda—48 resolutions—was the shortest ever; a welcome trend, since the Conference did not tend to become a race against the clock, and each resolution had time for an elegant sufficiency of discussion.

There must be many people unsure of the aims and function of the R.A.F.A., and this would seem a good moment to explain them. They were well expressed in the Association's 1952 Royal Charter:—

"To advise and assist members of the Association, persons eligible for such membership, and the wives and dependants including widows of members or persons eligible for such membership on all matters upon which they may seek advice, including Service and other pensions, disability awards, civilian employment and generally to extend a helping hand to former members of our Air Forces, their wives and dependants when sick or in need."

As well as this the Association exists to "foster good fellowship and a spirit of service amongst its members in perpetuation of the comradeship formed during service in any of the Royal Air Forces." A dual rôle, in fact, of welfare and comradeship.

Matters of pensions and disability awards have for long principally occupied the R.A.F.A., and this conference was no exception. Continued agitation and pressure and lobbying for better War Pensions and Allowances was the gist of the first resolution on the agenda. Speaking during the debate on this resolution MR. M. A. LIDDELL, a member of the National Council, reminded the Association that in the past three years 17 major improvements in pensions had been obtained in addition to substantial advantages to all pensions. And he cited the question of vehicles for the disabled: the R.A.F.A. had advocated that the single-seaters provided by the Ministry be scrapped in favour of a vehicle that the disabled man could take his family in, and had tested a number of such vehicles and proved them to be no more expensive than the single-seaters. The Ministry had in fact adopted this very policy.

(Continued on page 668)

Matters of Moment . . . .

It is worth noticing at this point that in this, as in so many matters, the R.A.F.A. works in close harmony with other ex-Servicemen's organizations in the broadest of united fronts.

Another resolution, recalling the statement: "You've never had it so good," called for greater efforts for those "who had never had it so bad." In support of this, MR. OSBORNE of the R.A.F.A.'s Wimbledon branch, who is always one of the conference's most persuasive speakers, described the sad plight of those living on fixed pensions in a rising economy. This motion, like the first, was carried unanimously.

Much time was spent in debating whether the elderly or the chronic sick merited the Association's most immediate attention and funds—the Association's convalescent home is an astonishing success, and they wanted to do something similar for the aged or the incurable. After some most heated controversy wisdom prevailed, and it was decided not to make a snap decision for one or the other, but to set up a committee to go into the matter—this committee to report at the next conference, when a decision will be made.

Besides matters of welfare the R.A.F.A.'s other aspect—comradeship—was much in evidence. A ball and a civic reception had been organized for the delegates, and on Sunday, as always, there was a memorial service and parade through the town. The conference was thus, for its 325 delegates, a judicious mixture of work and play, solemnity and relaxation—J.G.

Space Research at Slough

PEOPLE listening to the B.B.C. News and reading their newspapers last week might be excused for believing that Britain, at last, was about to play a major rôle in space development. "We're Off in the Space-race" was a typical headline. The truth of the matter is that the Government's Radio Research Station at Slough is to join with American and Canadian scientists in probing the ionosphere—the radio reflecting layer in the upper atmosphere—using an American launching rocket and a satellite designed largely in Canada.

This was announced in the annual report of the Department of Scientific and Industrial Research. It will involve co-operation in the joint U.S.-Canadian Topside Sounding Project which aims to probe the outer layers of the ionosphere by means of a radio-emitting satellite. Measurements will be obtained of the time radio pulses take to travel from the satellite into the ionosphere and back again to the satellite's receiver.

To assist in this and other aspects of space research, the Radio Research Station at Slough will in future devote half its resources to the work. A great deal of research on the ionosphere has already been done at Slough by measuring the height and density of the electrified layer from below. Measurement from above is expected to provide important new information, especially on the solar effects which lead to ionospheric disturbances and break-down of long-distance radio communications.

Northampton's Air-minded Mayor

CHARLES NEWTON, who has been six times chairman of the Aerodrome Owners Association, who was a founder of the Northamptonshire Aero Club and has been managing director of Sywell Aerodrome, Ltd., since its formation between the Wars, was elected the 745th mayor of Northampton on May 26. In view of his successful efforts to stage a practical demonstration of helicopter transport from a site near the city centre a year or two back, perhaps the townsfolk of Northampton may see their first citizen pioneering the use of a new form of mayoral conveyance. We are sure that the new mayor will do all he can to further the cause of aviation in the Midlands. It is a cause to which he has devoted much effort for many years. From his early days he has had a passion for flying.

When the 1914-18 War broke out he tried to enter the Royal Flying Corps, but was rejected on account of heart trouble. Instead he went into the drawing office of the Aircraft Manufacturing Co. and worked on the early D.H. war machines.

In 1935 after a spell in practice as an accountant, he devoted himself to civil aviation and became managing director of Sywell Aerodrome, Ltd. One of the founders of Northamptonshire Aero Club, and of the Northampton Air Training Corps, he was awarded the M.B.E. in 1954 for his efforts.

In 1943 Alderman Newton flew to North America with a mission to report on civil aerodrome developments in the United States.

He is a member of the National Civil Aviation Consultative Council and was chairman of the Committee on Accident Investigation Procedure.

His son, a former R.A.F. bomber pilot, is aviation manager at Karachi for an oil company.

1960 World Gliding Championships

TWENTY-EIGHT nations, among which Iceland is the only newcomer, will be represented at the World Gliding Championships which open at Butzweiler aerodrome, near Cologne, on Saturday, Jne. 4 and continue till Jne. 19. Most of their teams are already there for the preliminary practice week. British teams in the Open Class (27 entries) are:—

Lt.-Col. Tony Deane-Drummond, flying Slingsby's latest form of Skylark, the IIIF, with his wife and John Archer for crew; Commander Nicholas Goodhart, R.N., who finished second last time, and is to fly an EoN Olympia 419. His crew are Lorne Welch and Frank Irving.

Among 40 entries in the Standard Class, Britain is represented by Cdr. Tony Goodhart, R.N., flying a Skylark II, with George Burton and Toby Harrison as crew.

Ann Welch, as in every post-war championship but one, is team manager. Other official members of the British team are: C. E. Wallington, of the Meteorological Office; John Williamson, to keep all the radios working; and Andy Gough, of the R.A.F., in charge of maintenance.

David Ince, our reserve pilot, is present for the practice week.

In the Open Class the most interesting novelties are the German Phoenix, made mostly of plastics and flown by Ernst Günter Haase, the present World Champion; the Polish Zefir; and the two new American types: the RHJ-6 designed and flown by Dick Johnson, and Dick Schreder's HP-9 with which he set up World's Speed Records for each of the three sizes of triangle. The veteran in this class is a Weihe entered by the Swiss.

The Standard Class machines, which are entered also for the Ostiv prize, are mostly hotted-up versions of standard types of 15 m. span. A novelty is the American 1-23H, which is not, like previous Schweizer 1-23s, of metal, but of wood, to assist laminar flow.—A.E.S.

ENTRIES

Open Class

ARGENTINA
26 J. Ortner .. .. Skylark III
27 R. Hossinger .. Skylark III
AUSTRALIA
1 A. Gaze .. .. Skylark
CZECHOSLOVAKIA
19 V. Marecek .. Demant
20 V. Zejda .. .. Spartak
DENMARK
2 H. Jensen .. .. Skykrafter
FINLAND
4 H. Tandefelt .. Ka 6 CR
FRANCE
5 C. Labar .. .. Breguet 901
GERMANY
3 E. G. Haase .. Phoenix
GREAT BRITAIN
6 A. J. Deane-Drummond Skylark IIIF
7 H. C. N. Goodhart Olympia 419
HOLLAND
8 F. Seyffert .. Skylark III
HUNGARY
23 N. Opitz .. .. Gyor 2
ISRAEL
10 M. Bar .. .. Zugvogel 3
ITALY
9 G. A. Ferrari .. Skylark
JAPAN
11 I. Oda .. .. Zugvogel 3
POLAND
14 E. Makula .. SZD-Zefir
15 J. Popiel .. .. SZD-Zefir
SWEDEN
16 I. Sven Jonsson .. Zugvogel 4
SWITZERLAND
17 René Comte .. Elfe
18 B. Müller .. .. Weihe
UNITED STATES
24 R. Johnson .. RHJ-6
25 R. Schreder .. Air-Mate HP-9
U.S.S.R.
21 V. Efimenko .. A-15
22 M. Veretennikov .. A-15
YUGOSLAVIA
12 B. Komac .. .. Meteor 57
13 J. Mrak .. .. Meteor 57

Standard Class

ARGENTINA
70 J. Arteman .. Skylark II
AUSTRALIA
31 R. S. Rowe .. Ka 6
AUSTRIA
56 J. Fritz .. .. Stand. Austria
57 H. Resch .. .. Stand. Austria
BELGIUM
32 J. d'Otreppe .. Mucha Stand.
33 A. Xhaet .. .. Ka 6 B
BRAZIL
34 G. Münch .. .. Ka 6
35 C. Junqueira .. Ka 6
CANADA
36 G. Oates .. .. Ka 6
CZECHOSLOVAKIA
65 R. Mestan .. Standard
DENMARK
37 J. Friis .. .. Mucha Stand.
38 N. Sejstrup .. Ka 6 BR
FINLAND
41 J. Jalkanen .. Pik-3c
42 O. Rautio Pik-3c
FRANCE
43 D. Barbera .. Breguet 905
44 J. Lacheny .. Breguet 905
GERMANY
39 H. Böttcher .. Ka 6 BR
40 H. Huth .. .. Ka 6 BR
GREAT BRITAIN
45 G. A. J. Goodhart Skylark II
HOLLAND
46 S. Andrea .. .. Ka 6
47 W. Toutenhoofd .. Ka 6
HUNGARY
67 E. Kisely .. .. Stand. Futar
68 E. Mandl .. .. Junius 182
ICELAND
50 P. Filippusson .. Ka 6
ISRAEL
51 D. Arbar .. .. Breguet 905
52 A. Jardeny .. Breguet 905
ITALY
48 L. Brigliadori .. E/C 39
49 G. Silva .. .. MLoo-s
NORWAY
54 E. Backe-Mathisen Zugvogel 4
55 T. Johannesen .. Ka 6 B
POLAND
58 A. Witek .. .. SZD-Foka
SPAIN
59 M. Ara .. .. Ka 6
60 L. Juez .. .. Ka 6
SWEDEN
61 P. A. Persson .. Zugvogel 4a
62 I. Silesmo .. .. Ka 6 BR
SWITZERLAND
63 A. Gründisch .. Breg. Fauvette
S. RHODESIA
64 E. J. Harrold .. Ka 6
UNITED STATES
69 P. Bikle SGS-1-23H
U.S.S.R.
66 V. M. Ilchenko .. Standard
YUGOSLAVIA
53 E. Korsic .. .. Ilidenka

Aviation News in General

INDEX AVAILABLE.—The index to THE AEROPLANE AND ASTRONAUTICS, Vol. 97, August-December, 1959, is now in print. Copies are available on receipt of 4d. to cover packing and postage, from Temple Press Limited, Bowling Green Lane, London, E.C.1.

FISON-AIRWORK FUTURE.—Fisons, Ltd., is to relinquish its half interest in Fison-Airwork so that the latter company can be integrated with Bristow Helicopters to form the helicopter division of British United Airways. Fisons Pest Control, Ltd., and its subsidiary Fisons Farmwork will maintain an active interest in aerial spraying and will continue to place their technical resources at the disposal of British United Airways.

PROTOTYPE MOSQUITO. — The prototype de Havilland Mosquito W4050 is now on view until Oct. 2 at its birthplace, Salisbury Hall, London Colney, where it is earning money for the R.A.F. Benevolent Fund. It can be seen on Sundays, Thursdays or Bank holidays.

ALTITUDE RECORD.—The highest-ever landing and take-off made by an aircraft of any type, has been claimed for a helicopter mountain rescue with a Hiller 12E. Six landings and take-offs were made at 18,000 ft. on Mt. McKinley, U.S.A.

ANGLO-AMERICAN LINK.—Agreement has been reached between the Precision Products Division of Western Gear Corporation in America and Teddington Aircraft Controls whereby the American company will manufacture and sell the British company's products in the U.S. Western Gear will also provide "factory service" for Teddington equipment used in American aircraft such as the Boeing 707 and DC.8.

X-15 AGAIN.—A North American X-15 flew for four minutes at 107,000 ft. on May 19, reaching a maximum speed of 1,350 m.p.h. Total flight time after release from a B-52 was 11 minutes 30 seconds. On May 12, a maximum speed of 2,074 to 2,148 m.p.h. was reached. This exceeds the highest-known speed for a piloted aircraft.

LOST TOUCH.—Further to our report elsewhere in this issue, it is now disclosed that a communication fault in the Midas II missile-warning satellite may frustrate plans to test the satellite's ability to detect ground flares and missiles launched from Cape Canaveral by IR radiation.

HIGH EYE.—An Aerobee-Hi sounding rocket was fired from White Sands, New Mexico, to a height of 135 miles on May 27. Equipped with "eight optical telescopes," it was expected to provide the most complete map of the sky ever obtained by ultra-violet light.

SEASLUG. — Demonstration launchings of the A.W.A. Seaslug SAM took place from the experimental missile ship, "Girdleness," off Malta last week.

SUN-SEEKER. — A 150-lb. orbital "solar observatory" will be launched this year, according to NASA, as a development of experiments made with Aerobee-Hi sounding rockets. Stabilization system will keep astronomical instrumentation locked on the Sun with an accuracy of one minute of arc.

SOFTENING SATURN.—Parachute recovery system for the eight-engine Saturn booster of 1.5 million lb. s.t. includes a battery of solid rockets to be fired when a water-activated switch on a 100-ft. cable makes contact with the sea. Booster should enter the water at almost zero speed.

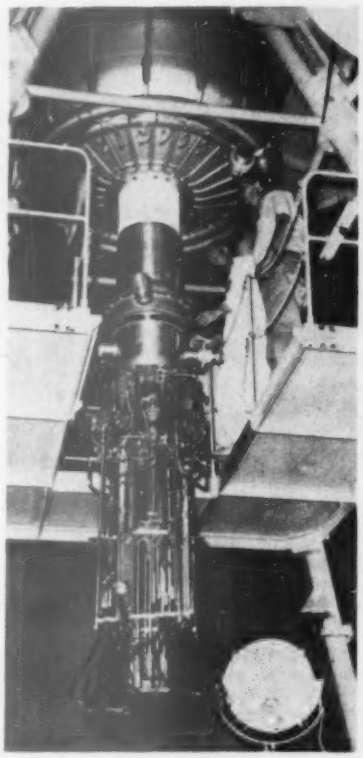
SOLAR PUSH.—Pressure of solar radiation is affecting the orbit of the 3.25-lb. "grapefruit" satellite, Vanguard I, to the extent of about one mile a year.

1968 SKYBOLT? — Gen. Thomas White, U.S.A.F. chief of staff, has told the space committee of the U.S. House of Representatives that it might be eight years before the Skybolt ALBM was ready for operational use.

LONGER-RANGE THORS.—It has been reported that the range of Thor IRBMs based in England has been increased to over 2,000 miles by the installation of more powerful rocket motors. As mentioned in our issue of March 18, Feltwell Thors have Rocketdyne MB-3-7 motors; missiles at Britain's other three Thor complexes have the more powerful MB-3-9.

NIKE-ZEUS.—A new version of the Nike-Zeus anti-missile missile has appeared with smaller fin and trimmer configuration. Gas-jets for manœuvre of the warhead are located in the forward fins, reports suggest.

COSTS SOAR.—Unit cost of Scout, the so-called "poor man's space-rocket," has risen from $500,000 to $750,000.



NUCLEAR URGE.—First picture of the prototype Kiwi nuclear rocket engine which will be tested at the Atomic Energy Commission's test site in the Nevada Desert in July. Here the control unit containing the radio-active power source and control mechanisms is slowly raised into the main body of the engine.

NEW ARRIVALS.—Newcomers to the British personal flying scene at Biggin Hill last week included the American Champion Tri-Traveler (right) and the Polish P.Z.L. Kos. The Tri-Traveler is the first of several imported by Mr. Edward Drewery, while the P.Z.L. 102B has been on a demonstration tour. Both aircraft have the 90 b.h.p. Continental engine.

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Commercial Aviation Affairs

MORE B.E.A. COMETS.—The total of orders for Comet 4 variants reached 50 last week-end with the purchase of two more 4Bs by B.E.A. The order (subject to Treasury approval) brings the B.E.A. Comet fleet to nine, of which six have been delivered. The two newest 4Bs are for delivery by March, 1961—less than a year from the placing of the contract.

ANOTHER POOL.—Negotiations for a quadripartite pool involving B.O.A.C., S.A.A., C.A.A. and E.A.A. are described as being "well advanced." The pool, which is to become effective in October when the new third-class services between the U.K. and Africa start, will replace a complicated series of separate pooling agreements between B.O.A.C. and the other three airlines.

MARCH STATISTICS. — Provisional M.o.A. figures indicate an 18% increase in the ton-miles performed by U.K. airlines on scheduled and inclusive-tour services during March. The overall load factor fell by one point to 60%. Traffic in the first quarter of 1960 has increased by approximately 21%. Although the number of passengers handled at U.K. airports in March increased by 11% there was only a 2% increase in air transport movements. Freight picked up and set down increased by 33%.

NORTHWEST MERGER? — Mr. Donald W. Nyrop, president of Northwest Airlines, said at the recent annual meeting that his company might be interested in an acquisition or merger with another airline. He denied, however, that any merger discussions had been held, or were contemplated with Capital Airlines. In the first four months of 1960 Northwest had a loss of $792,000 compared with a profit of $330,000 a year ago.

T.C.A. TO LONDON.—The Douglas DC-8 was introduced by T.C.A. on the route to London on Jne. 1, two months after going into service across Canada. On a proving flight on May 28, the 3,334 miles from Ottawa to London were flown in 5 hr. 55 min.

CAPITAL INQUIRY DROPPED.—Following changes in the management (see page 673) Capital Airlines has withdrawn its request for a subsidy. As a result, the C.A.B. has dropped its investigation into Capital's affairs. The Capital management is now hoping for permission to increase fares under the terms of the recent C.A.B. ruling (our issue for May 13, p. 576).

TARGET SURVEILLANCE.—A mockup of the new U.S. Army radio-controlled USD5 turbojet surveillance drone which made its first flight on May 14 from Yuma test station, Arizona.

S.A.S. INAUGURAL.—The inaugural DC-8 service on the S.A.S. Polar route from Copenhagen to Los Angeles was to take place today, Jne. 3. Among the guests on this inaugural flight were four members of the Scandinavian Royal family and three chairmen of the S.A.S. board of directors, as well as Mr. Ake Rusck, the president. S.A.S. carried its 100,000th passenger on this route on May 15.

N.Y.I. NOISE RULES—The F.A.A. has now proposed (May 10) special traffic rules and a mandatory runway system for turbojets at New York International, Idlewild. The rules follow those applied by the Port of New York Authority (see our issue of Oct. 17, 1958, p. 580), but with changes following the extension of 13R/31L to 14,600 ft. and include approach-angle limitations and a more detailed series of alternatives for different wind conditions. As before, the primary take-off runway will be 25L, which gives a climb-out over Jamaica Bay. Successive take-off priorities will be 13R, 31L and 7R. Similar rules went into effect on Apr. 4 at Los Angeles International (see our issue of Dec. 18, 1959).

AEROFLOT EXPANDS.—According to General Loginov, director of civil aviation in Russia, Aeroflot carried more than 20 million passengers. By 1965, the annual total is expected to be more than 50 million. Supersonic airliners would probably be in use by Aeroflot "several years from now," but which country would be the first to use them was described by the General as "a $60,000 question." Negotiations for a Moscow-New York service had reached Government level.

AN 880 ACCIDENT.—A Convair 880 of Delta Airlines crashed at Atlanta Airport on May 23 a week after Delta had become the first airline to operate this type. According to local reports the 880, which was on a training flight, struck the ground with one wing-tip while taking-off with one engine cut. The crew of four, including Delta's senior pilot, Capt. J. H. Longino, were killed.

News About People

COMMANDANT - IN - CHIEF.—H.M. the Queen has accepted the appointment of Commandant-in-Chief of the R.A.F. College, Cranwell. Her Majesty, accompanied by H.R.H. the Duke of Edinburgh, is to visit the College on Jly. 25 and present a new Queen's Colour at the passing-out parade. As Princess Elizabeth, Her Majesty was the Reviewing Officer at the passing-out parade at Cranwell in 1951, and the Duke of Edinburgh was Reviewing Officer in 1953.

AGRICULTURAL CONSULTANT.—Air Cdre. A. H. Wheeler, C.B.E., M.A., F.R.Ae.S., has been appointed as consultant to the Aviation Division of Pan Britannica Industries, Ltd., which is one of the largest operators of agricultural aircraft in the U.K.

ELECTED TO THE BOARD.—Wg. Cdr. Hugh C. Johnson, who has been with Flight Refuelling, Ltd., since its inception in 1934, has been elected to the board. In his new capacity he will continue to act as commercial manager.

B.O.A.C. ADVERTISING.—Mr. John Knox has been appointed advertising manager of B.O.A.C. with responsibility for the corporation's advertising throughout the World. He joined B.O.A.C. two years ago.

DOWTY DIRECTORS. — Mr. F. Bastow has been appointed managing director of Dowty Seals Ltd.; he joined the Dowty company in 1937 as assistant chief designer of landing gear and hydraulic units and became chief engineer of Dowty Seals in 1953. Mr. C. N. King joins the board of Dowty Hydraulic Units, Ltd.; he joined the company in 1955.

B.A.C. APPOINTMENTS. — Mr. E. Knight has been appointed commercial manager; Mr. E. L. Beverley, sales manager (guided weapons); and Mr. R. H. Sawyer, chief accountant, of the British Aircraft Corporation. Mr. Knight has been commercial director of Bristol Aircraft since 1956. Mr. Beverley has been commercial manager of English Electric's Guided Weapons Division. Mr. Sawyer has been assistant chief accountant of Vickers-Armstrongs (Aircraft) since 1956.

MINISTRY APPOINTMENT. — Air Vice-Marshal Sir Laurence Sinclair G.C., K.C.B., C.B.E., D.S.O., has been appointed controller of ground services at the Ministry of Aviation.

Air Transport

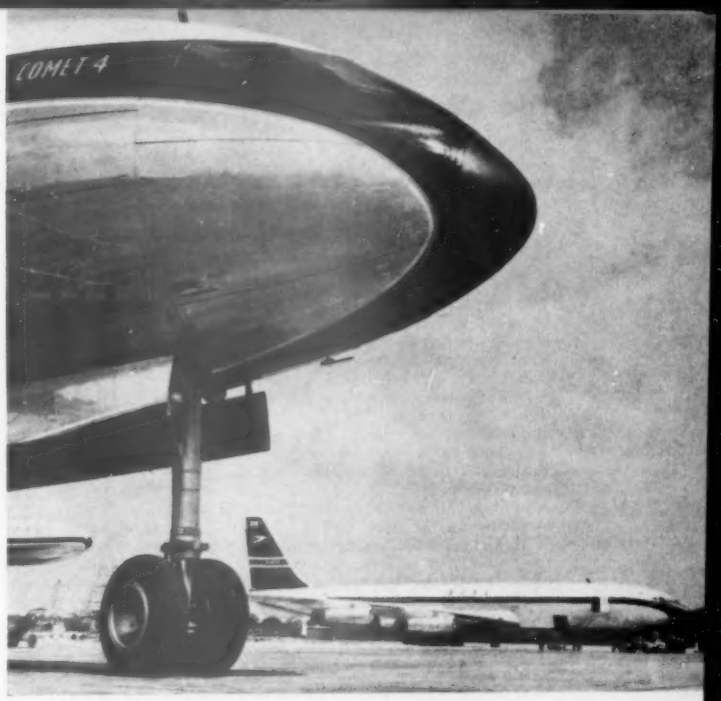
B.O.A.C. 707 Service Starts

THANKS to the rapid progress made with crew training in the past four weeks, B.O.A.C. was able to fly its first Boeing 707 service between London and New York on May 27. The flight was commanded by Capt. T. B. Stoney, manager of the 707 Flight, with Capt. Gordon Store as second in command, and carried 91 fare-paying passengers.

Two more round trips were operated by Boeing 707 in May, before the scheduled service on the London-New York route began on Jne. 1. The frequency of this service is twice a week, but one additional flight will be operated in the first week and five additional flights in the second week will give, in effect, a daily schedule. The additional flights replace scheduled Comet services, but Comets will continue to fly on this route throughout the summer. The Boeing 707s are laid out to accommodate 32 first-class and 97 economy-class passengers and the scheduled journey times are 7 hr. 20 min. to New York and 6 hr. 20 min. from New York.

Between Jne. 1 and Jne. 15, five special flights to Toronto via Prestwick and Montreal will be operated by 707 prior to introduction of the scheduled service on Jne. 18. Thereafter there will be one service a week via Montreal with the 32/97 seating and one a week via Prestwick in all-economy layout with 164 seats.

Five Boeing 707-436s had been delivered to B.O.A.C. by May 27, and a sixth had been temporarily returned to Boeing but was expected back by the beginning of this month. The original target date for 707 service had been Apr. 20 (see our issue for Jan. 15, 1960), so the certification delays has cost B.O.A.C. over five weeks' scheduled service with the type.



MONARCHS.—Following the introduction of Boeing 707s by B.O.A.C. on May 27, both the 707 and the Comet—seen together here at London Airport—will be flying Monarch services this month. Later, the 707 will take over these services completely, but none of the 707 layouts will be all first-class, as has been the case with the Comet.

Argosy Route Proving

A FOUR-PHASE, 300-hr. programme of route-proving flights by the Armstrong-Whitworth Argosy began in the middle of May and by the end of the month 125 hr. had been completed on flights to Europe and North Africa. The aircraft involved is No. 4, G-APRN, and the flights are being made from Birmingham over routes principally to Switzerland, Spain, Denmark, Sweden, Germany, Eire and Italy.

Most of the flights are commanded by the company's chief test pilot, Mr. Eric Franklin, and all so far have been manned completely by A.W.A. crews. Each basic crew comprises two pilots, two operations observers, one engineering observer, and three maintenance engineers for the transit checks at foreign destinations. In addition, a stewardess has been carried, and a contracts administrator to look after the paperwork. The aircraft is laid out for mixed operations with 24 seats, and on several flights the full passenger complement has been carried together with 10,000 lb. of cargo in the freight hold.

The first phase comprised 50 hr. and was completed in 5½ days, followed by a Check I at the home base, Bitteswell. Another 75 hr. were flown in 10½ days in the second phase, again followed by a Check I. The third phase also involves 75 hr. and will start immediately after the Whitsun holiday. For the fourth phase, totalling 100 hr., it is likely that the aircraft will be based at Bahrein and will be flown over typical Trans-Arabia Airlines routes. Trans-Arabia pilots may also participate in this final phase of the trials.

Six Argosies have now completed some 1,400 hr. flying, and the various development snags which have cropped up have all been overcome. The route proving is the last major requirement for the British Certificate of Airworthiness, which is expected in the late summer. The two aircraft ordered by Trans-Arabia Airlines should be in service by the autumn.

Facing the A.T.C. Problems

ONE of the important incidental results of the recent IATA technical conference has been the formation of a study group to investigate and to influence the trends in, and application of, air traffic control and associated techniques and systems. The setting-up of this group was one of the recommendations of the committee, under the chairmanship of Mr. H. E. Smith, B.O.A.C.'s Flight Services Manager, which reviewed A.T.C. and flight-planning problems.

The initial work programme for the group will consist of the formulation of standard pre-departure procedures; a study of the application and development of primary and secondary radar; the consideration of horizontal separation criteria; and a study of automation (in so far as it affects airlines) and other future trends in A.T.C. development.

It appears that the originally accepted principle that turbine-powered aircraft should be cleared for take-off from the apron—in other words, that they should be allowed to absorb A.T.C. delays prior to engine starting—is not being satisfactorily applied everywhere. The difficulties encountered in arranging such "through" clearances have been caused by fundamental inadequacies in airport apron and taxi-way design; by variations in runway occupancy times; by inadequate liaison between aerodrome and area control; and by lack of the necessary prediction information available to aerodrome control.

The penalties incurred by take-off delays are considerable and sometimes serious in the case of long-haul turbojets. A recent case at one major international airport, for instance, involved a wait, engines running, of well over an hour and the consumption of about 2,500 kg. of fuel. Such penalties are obviously not acceptable and the committee recommended that standardized procedures should be applied on a local basis, taking into account the traffic densities and passenger-handling arrangements.

Although experience in the U.S.A. with the use of secondary radar was apparently satisfactory, and was reducing delays and permitting closer separations, concern was expressed to the committee by some airlines at the way in which primary and secondary radar procedures were likely to be applied throughout the World without a prior overall study through the normal ICAO channels. The committee concluded that an IATA study of the application of primary and secondary radar was required, with the participation of manufacturers and administrations, and that ICAO should be urged to convene a special meeting. In short, it was felt that more experience was needed before authorities rushed into the large-scale application of radar procedures.

Particular stress was laid by the committee on the need to improve the standards of A.T.C. in certain areas and to ensure the attraction of the right kind of individual to this work and the adequate training of specialists. The problem, which had always been with us, was becoming acute with the introduction of turbojets. It was essential that the status, salaries and working conditions of air traffic control and communications staff should be commensurate with their responsibilities.

Other subjects discussed included the improvement of in-flight procedures, including those for holding and approach with turbojets; the reduction in the number of reporting points and boundaries (and consequent system discontinuities) for users of upper airspace; the problems of vertical separation, particularly at higher altitudes, and the standardization of procedures in the vertical plane; the elimination of VMC clearances in certain conditions; civil/military co-ordination; air-miss reporting; and IATA'S own rôle in the development of A.T.C. systems.

Air Transport . . . .

The Air-freight Business

THE progress made by B.E.A. in the development of air freight during the past five years has been remarkable—but, as we explained earlier this year (issue of Mar. 11, pp. 308-309), there has been no miracle involved. The build-up has been the result of hard and intelligent selling and good overall organization. For the most part, normal passenger services have been used on a fill-up basis and only about 35% of B.E.A.'s freight is carried in all-cargo aircraft.

Nevertheless, the time had obviously come for the Corporation to think about its future all-freight aircraft requirements and towards the end of April a three-day air-cargo symposium was held by B.E.A. in London to review the whole difficult subject of its freight policy. The meeting was attended by about 40 people, including representatives from British and American aircraft manufacturers, the shipping manager of a large industrial firm and a shipping and forwarding agent. With freight rates averaging only about two-thirds of passenger rates and with an essentially short-haul network, any all-freight aircraft will need to be fairly specialized and must offer levels of operating costs which will make it economic on all the Corporation's better cargo routes. Among the subjects discussed was the possibility of leasing three Argosies next year to replace the seven Pionair-Leopards at present in use.

Meanwhile, the Vanguard, with its big payload and considerable fill-up capacity in its developed versions, makes good sense in theory—but not necessarily, at present, in practice. The trouble is that the routes over which it can be competitively operated are not for the most part those over which there is a big offering of freight.

Although the freight-carrying ability of the Vanguard has always been one of its attractive features, this was fundamentally a "bonus" which sprang from the decision to use a double-bubble fuselage section and B.E.A.'s insistence on sufficient height in the baggage and freight holds for palleted loads. To take full advantage of the economic potential of the Vanguard Mk. II (of which B.E.A. will eventually have 14) with its 33,000-lb. payload, considerable quantities of fill-up freight will be required, and it will be B.E.A.'s policy, no doubt, to seek to generate freight on the routes for which the Vanguard is most suited. These are the shorter European routes where jet competition is not significant; the "colonial" routes to Malta and Gibraltar; and the domestic trunk routes.

West Indian Inquiry

FURTHER development of air services in the West Indies Federation will be studied by a commission of inquiry which has been appointed by the Federal Government. This commission, under the chairmanship of Sir Frederick Tymms, is expected to start work in Trinidad before the end of June. Its other members are Dr. Keith Bradfield, Australian assistant director-general of civil aviation; Mr. Stephen Wheatcroft, well-known aviation economist and former adviser to B.E.A.; Mr. C. S. Sundaram, aviation economist with ICAO; Air Vice-Marshal C. McC. Vincent, chairman, Trinidad and Tobago Air Transport Licensing Authority; and Mr. Abe Issa, chairman of the Jamaica Tourist Board.

The commission has been asked to examine and make recommendations on the whole question of civil aviation in the West Indies, British Guiana and British Honduras, to ensure that all territories of the Federation are linked by efficient, adequate and regular air services which are, so far as possible, self-supporting. A steady and progressive lowering of fares should, the terms of reference say, be one of the objects of the commission's recommendations "to encourage the people of the region to become really air-minded."

Other points which the commission is to consider and, where appropriate, advise on, are given as follows:—

(i) The review of the route network into and out of the Caribbean;
(ii) the scope for the economic operation by a West Indian airline of extra-regional services, including services to North, Central, and South America and Canada, having regard to the traffic rights position under bilateral arrangements;
(iii) airline competition and pooling arrangements to safeguard local national interests;
(iv) the scope for coach services and other economy class services into and through the federation to popularize air travel; and the scope for air freight services;
(v) the fare-structure of Intra-Caribbean services;
(vi) in the context of Federation, the administrative arrangements for the regulation of civil aviation in the area;
(vii) the financial implications involved in government support for, or participation in, a national air carrier.

The report of this commission will, presumably, help to settle the future of British West Indian Airways, at present a wholly owned subsidiary of B.O.A.C. There have been indications that the West Indies Federation would like to participate in some way in the affairs of B.W.I.A., and it seemed at one point as though B.O.A.C. might lose its connections altogether.

One of the problems has been the West Indian aspiration to operate a transatlantic service, and various types of U.S. jet aircraft have been evaluated with this end in mind. However, the purchase of American aircraft is unlikely to be approved so long as B.O.A.C. Associated Companies has any say in the matter, and the chartering of B.O.A.C. equipment and crews seems to provide a working compromise, at least for the present. Under this latter arrangement, a Trinidad-London service via Barbados and New York was started on Apr. 29 by Britannias in B.W.I.A. colours.

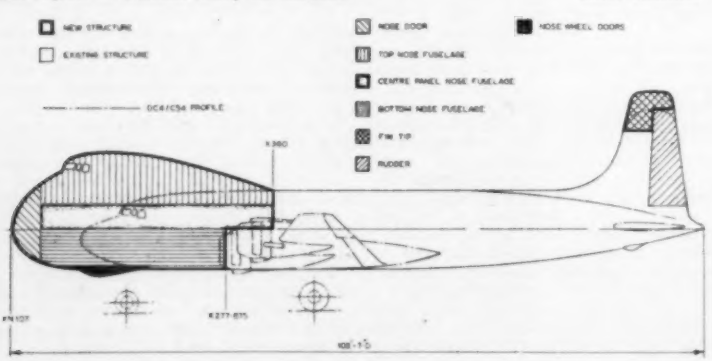
During 1959, the affairs of B.W.I.A. were studied for B.O.A.C. by Air Cdre. G. J. Powell, who subsequently joined the Board. This followed the net losses recorded by the airline of £260,000 in the year 1957-58 and nearly £600,000 in 1958-59. Also during 1959, Mr. H. O. B. Wooding became chairman in succession to Sir Errol dos Santos, who was elected president. Recent months have seen a big upward trend in B.W.I.A. traffic but this is not expected to have made any significant improvement to the B.W.I.A. financial results for 1959/60.

Interest in the ATL-98

FIRST positive indication of overseas interest in the Aviation Traders (Engineering) ATL-98 came with the announcement last week that an order is being considered by Ansett/A.N.A. The Australian airline is interested in obtaining conversion kits, in order to undertake conversions of an unspecified number of DC-4s in Australia. The company's fleet at present includes two DC-4s.

The ATL-98 was designed by Aviation Traders to meet the needs of Channel Air Bridge for a vehicle ferry of larger capacity and better performance than the Bristol Freighter which it will replace. In the vehicle ferry rôle it can carry five cars and 25 passengers, but, as we explained in our issue for Feb. 26, this conversion of the DC-4 is of considerable interest as a general freighter, too. Retaining all the well-proven and popular characteristics of the DC-4, the ATL-98 has, in addition, the increased flexibility, better loading and improved load-carrying ability which derive from the nose-loading doors.

The first conversion is now taking shape at Southend and is expected to fly at the end of this year, with a second in March, 1961. A full British C. of A. will be obtained, and aircraft should be available for service by the middle of next year. Including the cost of an average secondhand DC-4, the ATL-98 conversion is expected to cost about £150,000, but Aviation Traders has indicated its willingness to supply conversion kits and Ansett/A.N.A. hopes to take advantage of the latter scheme.



Differences between the DC-4 and the Aviation Traders ATL-98 are shown in this diagram. The wing and powerplant remain untouched. As noted above, overseas interest in this project is growing.

EVEN BETTER THAN PROMISED

Before the first Vanguard goes into scheduled service, and little more than a year after the first flight tests, development has made possible dramatic increases in maximum operating weights. Details are given in the table below. These improvements have been achieved for an empty weight increase of only 600 lb, and allow a margin of 1,600 lb for future development, equipment changes or customers' special requirements.

VANGUARD PAYLOAD UP BY 8,000 lb

	Original specification	New specification	Increase
GROSS TAKE-OFF WEIGHT	141,000 lb	146,500 lb	**5,500 lb**
MAX. LANDING WEIGHT	121,000 lb	130,500 lb	**9,500 lb**
MAX. 'ZERO FUEL' WEIGHT	112,500 lb	122,500 lb	**10,000 lb**
MAX. PAYLOAD	29,000 lb	37,000 lb	**8,000 lb**

The Vanguard can now carry 139 economy-class passengers plus over 8,000 lb freight. Without intermediate refuelling, 100-passenger payloads can be carried over such important consecutive sectors as London–Frankfurt–Vienna–Prague.

Operators with profit in mind and air travel for all in view, will find the Vanguard is more attractive than ever.

VICKERS VANGUARD

FOUR ROLLS-ROYCE TYNE PROPELLER-TURBINE ENGINES

The airliner with the biggest profit potential ever offered to the operator

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED WEYBRIDGE SURREY

D

working pilot

The IFALPA delegate speaking to the ICAO Special Meeting, Montreal, February 1959

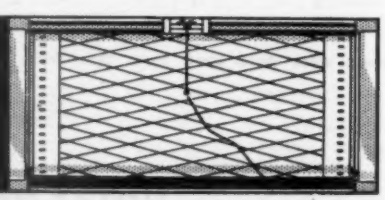
We do not have any difficulty with the words "Area Coverage" but apparently some people do. In general terms what it means is the ability to navigate in any part of an area with precision. We feel that pictorial presentation is a proper part of an area display.

The present standard in high density areas has been most highly developed and used in the U.S.A. The New York area is an area of high traffic flow, and it is appropriate to review the functioning of the present system in its most complete form and where it is under the most severe test. We are most concerned with the ability of VOR to provide what we feel is essential in high density areas—helicopter cover and aid for high flying aircraft.

In the area there are 34 stations which use 33 frequencies, and aircraft flying at 40,000 feet in the area will, under normal conditions, hear all of them. Basically he will hear the 34 stations in the area, and under abnormal conditions also those in the area to the West and South; a total of 69 stations using 60 frequencies.

I might mention that we have a problem with frequencies — we have apparently exhausted them in this area. We also have a problem with low frequencies. The power of some low frequency beacons is quite low, so that you can usually not tune them in until you reach somewhere in the neighbourhood; you will not get an A.D.F. signal until you are perhaps six or seven miles away, and occasionally pilots have gone right over them without picking the signal up. Our proposal for area coverage would surely not solve every problem, but it does offer some potentials for solving this and similar problems.

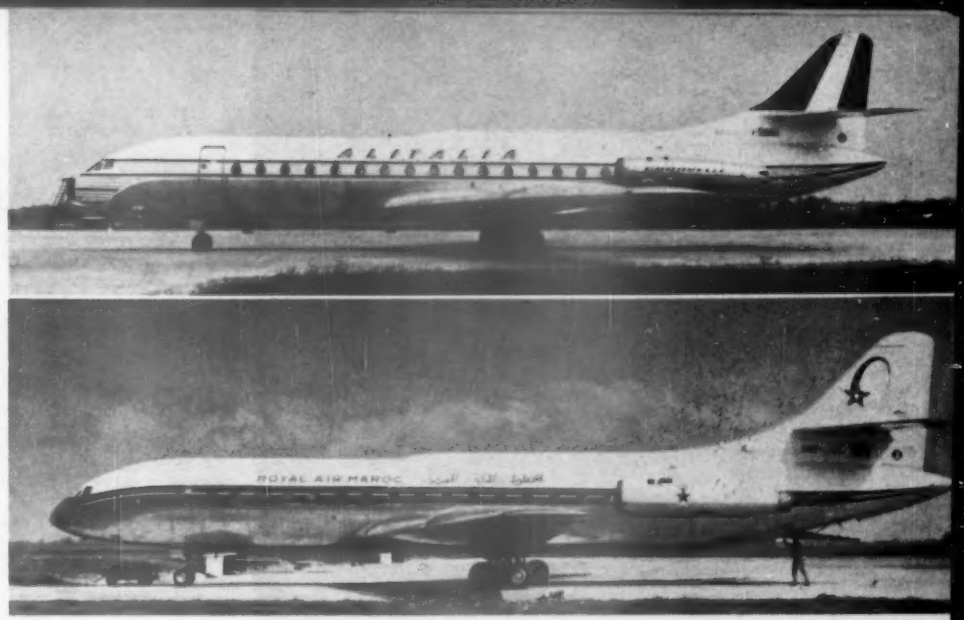
THE DECCA NAVIGATOR



THE NAVIGATION SYSTEM FOR THE JET AGE

THE DECCA NAVIGATOR COMPANY LIMITED LONDON

Air Transport . . . .



NEWCOMERS.—Newest operators of the Sud-Aviation Caravelle are Royal Air Maroc and Alitalia. Both airlines took delivery of their first aircraft last month, and Alitalia began flying Caravelles on the Rome-London route on May 23.

B.E.A. Do Better Still

TABULATED below are B.E.A.'s traffic results for April, showing a 30% increase in passenger traffic compared with the same month of 1959. The fact that the Easter holiday occurred during April this year had a significant effect on the result. For the two-week holiday period, B.E.A. was averaging nearly four million passenger-miles a day, and on the day before Good Friday more than 14,000 passengers were carried. In the six months from April to September, B.E.A. expects to carry as many as 2½ million passengers.

The new equipment programme is playing an important part in this expansion, although, as recorded elsewhere, the introduction of the Vanguard will unavoidably be delayed. The extent of this delay—which is not yet known—could have a serious effect on B.E.A.'s ability to take advantage of the new traffic potential this summer depending on the extent to which other aircraft can be chartered to cover the services which were booked on the basis of Vanguards being available from Jly. 1.

Subject to any changes which the Vanguard situation may require, B.E.A. plans to replace DC-3 Pionairs progressively with Viscounts on the domestic routes during the year. By July, all the Irish Sea routes will be operated by Viscounts, and most of the Pionairs will have been sold by the end of this year. Sales of the DC-3—as one would expect—have not been difficult to arrange, and B.E.A. has disposed of 10 at "satisfactory prices" in the first four months of this year.

TRAFFIC RESULTS—APRIL, 1960

	April 1960	April 1959	Variation
Capacity ton miles offered ..	18,321,000	14,454,000	+26.8%
Load ton miles sold	12,205,000	9,502,000	+28.4%
Revenue load factor	66.6%	65.7%	+ 1.4%
Passengers carried	313,038	240,986	+29.9%
Passenger miles flown	110,546,000	85,013,000	+30.0%
Passenger load factor ..	66.8%	67.2%	— 0.6%
Freight ton miles	1,303,000	1,129,100	+15.4%
Mail ton miles	320,200	329,700	— 2.9%
Aircraft miles flown	3,260,000	2,786,000	+17.0%
Revenue hours flown	16,000	14,382	+11.3%

Capital Struggles On

A FURTHER 10-day extension of the deadline for Capital Airlines to reply to Vickers-Armstrongs' foreclosure suit was announced on May 25. The deadline had previously been extended from May 9 to May 27, so the new date for the airline's appearance before the U.S. Federal Court is Jne. 6.

This further delay, although indicating Vickers' willingness to give Capital every reasonable chance to overcome its difficulties, seems unlikely to bring the airline any closer to a solution. As announced last week (our issue, page 635), important changes have been made in the airline's top management. The most significant of these was the replacement of Mr. Charles H. Murchison as chairman of the executive committee. He is the largest single stockholder and board vice-chairman.

Although Mr. Murchison remains on the board, he has been replaced on the executive committee by Mr. Arthur F. Kroeger (another director). Mr. Thomas D. Neelands has been brought in as chairman, with the support of the majority of the Capital board.

Commenting on the changes, Mr. David H. Baker, Capital's president, said that they would "achieve unification of management" and ensure a completely unified team. He also confirmed that Capital is greatly interested in merging with another airline, and said that there had been informal talks with officials of other carriers although there were at present "no firm negotiations."

Cautious Optimism

IN his paper, read before the Royal Society of Arts on May 25, Mr. Peter Masefield made a number of pertinent points whilst surveying, in general terms, "The Problems and Prospects of Air Transport." For instance, in his introduction, he said that, though technical development was more rapid than ever, "the economic and commercial progress of the business appeared often to be pursuing an ill-defined and wavering path."

Looking at the future, he quoted Donald R. P. Marquis who wrote: "Ours is a world where people don't know what they want and are willing to go through hell to get it." Later in his paper Mr. Masefield echoed a view which is now being generally accepted—to the effect that in this turbojet era, when profits and losses are balanced on a knife edge, some airlines will face a battle for survival. "More mergers in airlines," he said, "seem certain."

Air transport was unique in that passenger traffic accounted for 78% of the total load ton-miles operated. At sea 86% of the revenue came from cargo. Average World airline costs worked out at 35d. per capacity ton-mile—by comparison with 4d. on the roads, 1.5d. by rail and 0.15d. by sea—but, though 230 times more expensive than sea transport, air transport was about 15 times faster.

Statistics suggested that there was a large untapped market not only in the short-haul but also in the medium-haul field. U.S. figures showed that 57% of all passengers travelled on journeys of less than 50 miles and that over journeys of less than 200 miles, only 10% of the passengers travelled by air. Here was potential for the helicopter—if costs could be made reasonable. During 1959 in the U.S.A. 54 million passengers (or 10% of the total) moved over 250-1,500 miles. This number was 15 times greater than the combined air/sea Atlantic passenger total. So there was ample potential for the subsonic (probably turbofan-powered) fixed-wing aircraft.

Mr. Masefield thought that the tendency for traffic-freedom restrictions designed for the benefit of small-nation prestige airlines, was likely to increase rather than to decrease in the future—with the possibility that, because of the very high cost of the coming generation of supersonic aircraft, these nations may ban competitive services with such aircraft, except at very high premium fares, or restrict their frequency. Either way, the travelling public will suffer.

In his conclusions he stressed the fact that the major reason for the poor recent economic results in the U.S.A. has been that the turbojet re-equipment programme has been far outstripping the financial resources available. "Air transport as a whole," Mr. Masefield said, "would be in a much more healthy situation, economically, had 'the jet age' been postponed for five years or so."

NEW TERMINAL.—The new terminal building at Kastrup Airport, Copenhagen, was opened by King Frederik of Denmark on Apr. 30. This aerial view shows the two-finger layout of the terminal, with some 14 gates in each elevated finger. The main transit lounge, also at first-floor level, provides accommodation for 1,000 passengers.

Friendship Variants

TO distinguish between versions of the F-27 powered by Rolls-Royce Dart R.Da.6 Mk. 511 and R.Da.7 Mk. 528 engines, the Fokker company has recently adopted the designations Series 100 and Series 200 respectively. Fairchild uses the designations F-27 and F-27A to make a similar distinction. Of the 34 Friendships which had been delivered by Fokker up to the end of April, 11 were Series 200 aircraft, including all those for Australian operators except the first six for T.A.A. (see our issue for Apr. 29).

Aircraft for cargo operations, with the large cargo door, reinforced floor and other detail modifications, are called Freightships by Fokker and are designated F-27B by Fairchild. Fokker is building two Freightships for K.L.M. and one for Pakistan International (in addition to four F-27s); Fairchild has delivered three F-27Bs to Northern Consolidated. For military use there is the F-27M Troopship, which can carry up to 45 paratroops, 13,000 lb. of supplies or 24 stretchers with seven attendants. Nine of the 12 F-27s ordered by the Royal Netherlands Air Force from Fokker will be Troopships.

The possibility of installing 2,660 e.h.p. Rolls-Royce Dart R.Da.10s in the F-27 has been studied both by Fokker and Fairchild, the latter company identifying this project as the F-27E. Eastern Air Lines is said to be considering the purchase of up to 30 of this version.

Another Fairchild variant under consideration is comparable with the Troopship, with provision for rear loading and STOL characteristics. The gross weight would be 38,500 lb. and 2,500 e.h.p. Darts would be used. At 34,000 lb. the military F-27 would have a take-off ground roll of 560 ft. and would carry a 6,000 lb. payload over 250 naut. miles.

At the end of April, 99 Friendships had amassed 150,000 flying hours in the 18 months since regular airline service began. Of this total Fokker had built 27 for airline use and seven executive and V.I.P. models; the Fairchild totals were 47 and 18 respectively. Several modifications have been introduced on the Fokker production line in the course of the past 18 months, including an increase, from the 31st aircraft, in standard integral fuel capacity from 798 to 1,114 Imp. gallons. Four aircraft have been delivered with two 200 Imp. gallon pylon fuel tanks under the wings and these are available as an optional extra.

The increase in maximum take-off and landing weights already announced was accompanied by a minor undercarriage modification to increase the size of a drag stay bolt, and fitting higher capacity brakes. Series 200 aircraft also now have simple dynamic vibration dampers on some fuselage frames to give an 8-12 decibel reduction in cabin noise level.

Utilizations in Australia

ONCE again the statistics compiled by the Australian Department of Civil Aviation for the 12 months ended Dec. 31, 1959, show some quite remarkably high average utilization figures.

Top of the list, surprisingly enough, is the Lockheed 188 Electra, even though this aircraft was only in its first year of service. The two Electras operated by Ansett/A.N.A., which entered service on Mar. 18 and Apr. 13 respectively, averaged 10.19 hours a day, or 3,718 hours per annum on scheduled operations. T.A.A.'s two Electras, operated over a much shorter period, had, at the end of the year, averaged even higher figures—10.37 hours a day and 3,785 hours a year. Mean Electra block speeds were of the order of 320-330 m.p.h.

Other very high scheduled-service utilization figures were: DC-6B (four, Ansett/A.N.A.), 3,429 h.p.a.; Convair 340/440 (two, Airlines of New South Wales—previously Butler Air Transport), 3,530 h.p.a.; DC-3 (five, MacRobertson Miller), 3,190 h.p.a.; and L-1049 (11, Qantas Empire Airways), 3,008 h.p.a. The DC-3 figure is particularly noteworthy and is much higher than any other utilization recorded in Australia for this workhorse during 1959. The flying hours used as a basis for these figures are "chock-to-chock" and include taxi-ing.

The Caravelle—and Others

A FEW more details of future variants of the Caravelle are now available to add to the brief details in our recent Commercial Aircraft Number (Apr. 29 issue). As explained in that issue, variants up to the Caravelle 6 are powered by different versions of the Rolls-Royce Avon. Deliveries of the Caravelle 3 have now begun (to Alitalia and Air France) and the Caravelle 6, as ordered by Sabena and United, will be coming off the line early next year.

The Caravelle 7 designation is now used for the version with 16,100 lb.s.t. General Electric CJ805-23 turbofans, while the similar variant with 14,340 lb.s.t. Rolls-Royce RB141/3s, originally known as the 7, is now the Caravelle 8. The first Caravelle 7 will be the General Electric test-bed, which is to be delivered to the U.S. on Jly. 14 this year. General Electric has placed a $1.2-million contract with Douglas for production of five engine cowl, pod and stub assemblies, for delivery in November. The CJ805-23 pod is shorter than the Avon's, with an additional intake for the aft-fan about half-way back.

The next known stage of Caravelle development is the 14, which is now the subject of Sud-Aviation-Douglas collaborative engineering. With 15,000 lb. RB141/11A by-pass engines this variant will, it is reported, carry 95 passengers and would have a full payload range of at least 1,900 naut. miles. M. Georges Hereeil said of the Caravelle 14 recently, "This medium-to-long-range aircraft, which will have the same flying qualities and the same standard of comfort as the present-day Caravelles, need fear no competitors. With its non-stop range of 2,000 to 2,200 miles the Caravelle 14 will fulfil a definite requirement."

Whether or not the Caravelle 14 "need fear no competitors" is, perhaps, a matter of opinion. The short-to-medium haul bracket continues to attract the attention of many important airlines, and manufacturers in both the U.K. and the U.S.A. are devoting much effort to meeting this requirement, as we discussed in our issue for Jan. 22, 1960 ("Short-haul Prospects," p. 96). Since that time, the Douglas DC-9 has been abandoned in favour of the Caravelle, but Boeing appears to have come closer to a decision in favour of proceeding with the 727. This project now has three rear-mounted engines—either Allison ARB963 (Rolls-Royce RB163), Pratt & Whitney JTF-10 or General Electric turbofans—and a 114 ft. 8 in. fuselage of 139-in. diameter seating up to 114 passengers. According to Australian reports, the Boeing 727 would sell for about $4m. and could be available in 1963. United and Eastern are among the airlines interested in this project.

Convair has its Model 60 in the project stage—a twin-engined 145,000 lb. gross weight aeroplane based on the JT3D-5 or CJ805-41C turbofans. This company is also particularly interested in concluding an arrangement with the Hawker Siddeley Group to obtain similar rights in the D.H.121 as Douglas have for the Caravelle. Versions of the D.H.121 are now being developed to meet the particular requirements of the U.S. market, with more range than the B.E.A. type.

The projected Vickers VC11 remains the largest of the aircraft in this particular category. Some additional details of this type which were recently published (though not by the makers) indicate a gross weight of 157,000 lb. and maximum seating for 137 passengers. The four Rolls-Royce RB163 engines would allow a maximum cruising speed of 489 knots. A 460-mile stage length would be flown in 69 minutes block time in zero wind.

N.G.T.E. Develops STOL Techniques

AERODYNAMIC circulation control stole the thunder at the National Gas Turbine Establishment last week, although it was only one of many exhibits shown when the establishment was open to visitors. The N.G.T.E., which is at Pyestock, in Hampshire, has been working for five months on this particular aspect of using air, bled from a turbojet, to improve the lift, stability and control of aircraft. Considerable claims have been made for this technique, which has been hailed in daily newspapers as a big advance. It is fair to say, however, that senior members of the Establishment consider that the technique is in its very early days and that its potential remains to be proved. So far, only limited wind-tunnel work has been done. Much more development will be needed before the newspaper claims are justified.

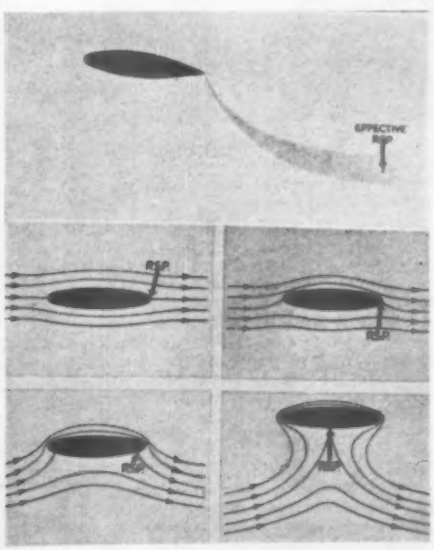
If circulation control does in fact offer as much as its adherents claim, it is to be hoped that it will be applied to practical aeronautics more rapidly than the N.G.T.E.'s earlier development—the jet flap. Research on this technique was mainly during 1952-54, but no aircraft using it has yet been flown, although Hunting are now building a jet-flap research aircraft under Ministry of Aviation contract. Such slowness in exploiting a new development is to be deplored. No doubt M.o.A. will claim that the Treasury have been difficult to convince of the merits of the new scheme.

How Circulation Control Works

The underlying concepts of circulation control are as old as aerodynamics itself, but the current N.G.T.E. work is devoted to marrying them to the turbojet—in particular, to the by-pass or ducted-fan engine.

Current tests aim at increasing the lift of a wing by ejecting air through tangential slots at its trailing edge and thus increasing the circulation round the wing and hence its lift. This technique moves the rear stagnation point along the under-side of the aerofoil towards the leading-edge. Lift coefficients of more than six have been achieved during wind-tunnel tests.

The technique is proposed for use during take-off and landing to give high lift. During the cruise it could improve the L/D ratio, both by increasing lift and by using the flow ejected through the rear of the wing to reduce wake drag. There would be sonic flow at the slots, which would be supplied with relatively cool air bled from an engine's by-pass duct. Tests show that a row of holes is as effective as a continuous slot, which would be more difficult to produce in practice. Less than 17% of the engine's total thrust would be ejected for circulation control, the balance being used for normal propulsion.



OLD AND NEW.—With the jet flap (top) a powerful jet divides the upper and lower airstreams behind the aerofoil. With direct circulation control (left) blowing through slots on a rounded trailing edge allows the position of the rear stagnation point (R.S.P.) to be varied at will.

TEST CELL.—Construction of this large engine test cell will be completed before the end of 1960. Two other cells are in use at the vast engine-test facility of the N.G.T.E. and a fourth is planned.

It is also suggested that moving control surfaces such as elevators and rudders could be eliminated by using circulation-slots which were blown differentially; these would produce the necessary lift without physical deflection of a control surface.

Circulation-control techniques, as well as the use of the jet-flap, will really come into their own with the introduction of the by-pass or ducted-fan engine. Such types as the Rolls-Royce RB.163 and Bristol Siddeley BS.75, a variant of the BE.53, make the exploitation of these techniques a worth-while and safe proposition, according to the N.G.T.E. In general, circulation control is applicable when up to 17% of the engine

PYESTOCK POINTERS

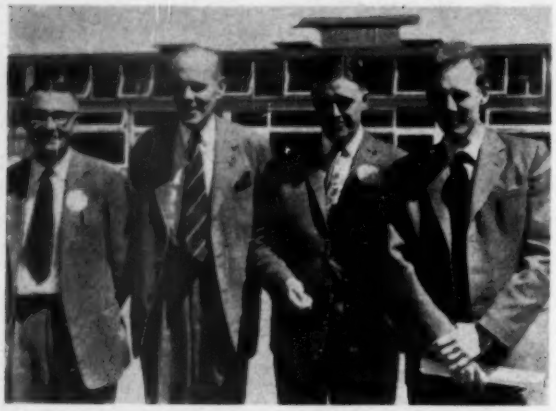
CIRCULATION CONTROL—promises high lift for STOL performance, low wake-drag and the elimination of moving control surfaces.

COMPRESSOR NOISE—may be reduced considerably by running compressors at higher speeds or by choking their intakes, either by physical or aerodynamic means.

RAMJET VEHICLES—reached Mach 2.71 and 106,000 ft., after flame-out at 69,000 ft., during a 10-year flight programme ending in 1959.

DUCTED-FAN VTOL ENGINES—are preferred to pure-turbojet lift engines for civil operation because of the lower speed, temperature and noise of their jet exhaust.

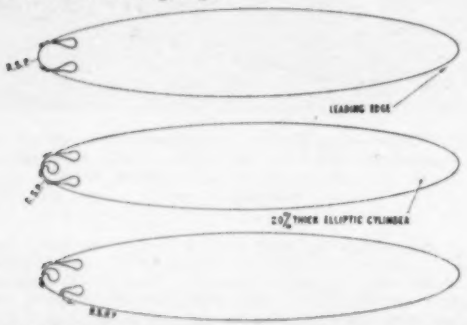
NUCLEAR AIRCRAFT—are probably more than 10 years away. Their all-up weight is unlikely to be under 1,000,000 lb. and they will be suitable only for military low-level operations.



PERSONALITIES.—Mr. Hayne Constant, director of the N.G.T.E. (second from left), is seen here with Mr. V. E. S. Mitchell (left) and Mr. P. Lloyd (second from right), who are deputy directors, and (right) Mr. I. M. Davidson, whose jet-flap work is well known.

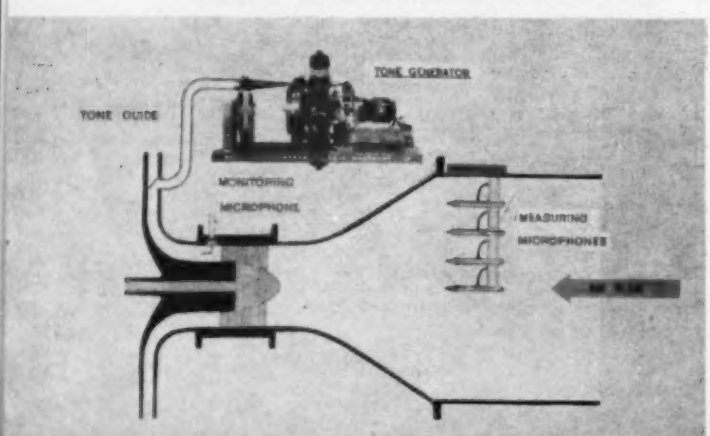
thrust is ejected through the control slots; above this value of slot-thrust the jet flap takes over. In both cases the relatively cool by-pass flow would be tapped, and not the hot turbine efflux. Incidentally, this represents a change of view on the jet-flap by the N.G.T.E., which originally suggested that the whole jet exhaust should be ejected through the narrow jet-flap slot.

Wind-tunnel tests have been made using an elliptic cylinder 20% thick with blowing slots at its trailing edge. Slot configurations are shown in the diagram below; the greatest lift is expected with the third arrangement in which three slots direct the flow around the trailing edge. The bottom slot ejects air along the lower surface of the wing in the direction of the leading edge.



TEST PROGRAMME.—Circulation-control tests have already been made on the top elliptical aerofoil. Wind-tunnel tests are now in progress with blowing slots as shown on the middle aerofoil and they are planned with the bottom layout. Lift coefficients achieved or anticipated are respectively low, high (above 6) and very high.

These tests are only being made with a two-dimensional model spanning a wind-tunnel; three-dimensional tests have not yet been made. Tests are planned with thinner elliptical aerofoils which more closely represent high-speed wing sections.



COMPRESSOR NOISE.—To study the attenuation of noise through an axial compressor a tone generator is being used to supply a known noise level downstream. Its attenuation in passing upstream through the compressor is measured.

Noise

The subjective effects of noise are being studied by the N.G.T.E. and a current programme is devoted to helicopter noise. Visitors to the Establishment last week were asked to give their opinion on the relative annoyance value of pairs of rotor-noise recordings.

Included in the Establishment's programme is a study of compressor noise. This is of relatively greater importance on ducted-fan engines where the jet velocity is reduced and jet noise does not necessarily predominate.

N.G.T.E. studies have shown that the noise level of an axial-flow compressor is reduced by an increase in rotational speed as well as by choking of the intake.

The physical mechanism of this reduction in noise level with increase of speed is not yet understood; it is due partly to a Mach-number effect and partly to the wavelength of sound. The effect is being studied by supplying a known noise level downstream of a compressor and measuring its attenuation after passing upstream through the compressor.

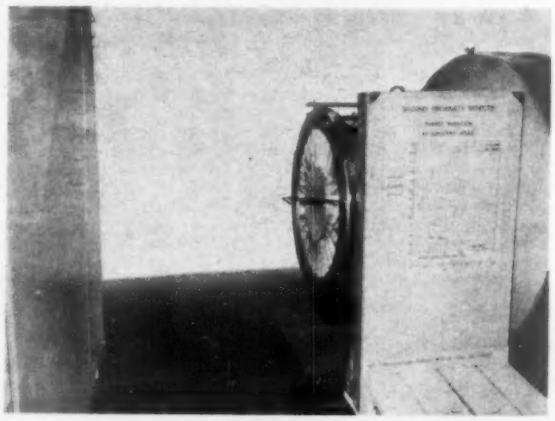
VTOL and STOL

According to the director of the N.G.T.E., the Establishment feels that STOL performance should be approached by using engine-assisted lift to reduce take-off and landing speeds. Work towards this began some eight years ago with the jet-flap. Then came jet-deflection work. The landing speed of a Meteor with jet deflection was reduced by more than 20 kts. Better results should be achieved with jet-flap or aerodynamic circulation control methods of using engine thrust.

One exhibit was devoted to lifting fans and VTOL techniques. An interesting table, reproduced on page 677, shows the N.G.T.E. views on the types of engine and VTOL technique suitable for vehicles with cruising speeds ranging from 50 to more than 500 kts. In general, the higher the cruising speed the greater is the jet velocity during hover and the higher the hovering fuel consumption and noise level.

For civil projects tip-drive lift fans or ducted-fan lift engines are considered to be more practical than simple turbojet lift engines. This is because their jet velocity, temperature and noise level are all lower.

Ground erosion, or softening of tarmac, is another problem with the simple jet-lift engine. If its efflux velocity is 2,000 ft./sec. and temperature 700° C., the velocity at ground



FAN LIFT.—When a lifting fan is close to the ground its useful thrust is reduced; the effect is being studied with this rig. A board representing the ground (left) is moved towards the fan and the variation in thrust measured.

level is 595 ft./sec. and the temperature is 332° C. when the aircraft is hovering at 20 ft. Corresponding values at ground level are 350 ft./sec. and 81° C. for a fan efflux with a velocity of 500 ft./sec. and temperature of 90° C.

An interesting demonstration was given of the way in which ground effect altered the thrust of a lifting fan. Below $0.25^{H}/_{D}$ (height above ground÷by fan diameter) the fan is stalled and produces no lift. From $0.25^{H}/_{D}$ to about $0.75^{H}/_{D}$ the useful thrust increases rapidly, and then more slowly up to $1.3^{H}/_{D}$. Between 1.3 and $1.5^{H}/_{D}$ the thrust is unstable, but above $1.5^{H}/_{D}$ it remains steady.

Above $1.5^{H}/_{D}$ a base drag acts on the fan hub and reduces fan lift by about 5%. But below $1.3^{H}/_{D}$ there is an opposite hovercraft effect, giving a beneficial thrust on the hub. This gradually increases fan lift by up to 10% until the fan is so close to the ground that it stalls. The investigation of this ground effect was begun early in 1960.

Ramjets

A long-term flight-research programme with ramjets was begun by the N.G.T.E. in 1949 and concluded last year. During this time 37 vehicles were launched at Aberporth. All were designed by the N.G.T.E. and built by Napier. The ramjets tested were mainly of the same 16-in. diameter as the Bristol Siddeley Thor which powers the Bristol Bloodhound surface-to-air missile.

Lift-engine jet speed, efficiency and noise for VTOL craft.

Cruise speed, kts.	Type	Jet velocity during hover, ft./sec.	Hovering s.f.c. lb./hr./lb. of lift	Noise level* at 200 ft. radius, db.	Hover time for fuel consumption =1% of all-up weight, mins.
50–80	Hovercraft (fan) ..	150–300	0.02–0.04	95	15–20
100	Helicopter	70	0.07	100	9
200	Tip-jet helicopter with wing	80	0.15	110–115	4
300	Tilt-wing with propeller	160	0.15	105	4
300–500	Ducted-fan lift engines ..	400–800	0.3–0.6	105–110	1–2
400–500	Ducted-fan lift/thrust engines	1,000–1,200	0.6–0.7	110–115	1
Over 500	Fan-lift or turbojet lift engines	700–2,000	0.5–1.0	110–125	1–0.5

*This applies to a lift of 10,000 lb. Add 10 db. for 100,000 lb. lift.

During launches made in the years 1951 to 1954 the vehicles reached heights up to 27,000 ft. and speeds up to Mach 2.4. During 1955 and 1956 the emphasis was more on altitude, with flights up to 57,000 ft. and Mach 2.2. Between 1957 and 1959 both height and speed ranges were extended—to 69,000 ft. and Mach 2.71 respectively.

The fastest test vehicle, the 34th to be launched, reached Mach 2.71 after accelerating from Mach 1.70 in 27 sec., an average acceleration of 0.9 *g*. The highest-flying vehicle, the 32nd, maintained combustion up to a height of 69,000 ft., which it reached in 40 sec. It then coasted up to a peak height of 106,000 ft.

Current ramjet work at the N.G.T.E. is devoted to the matching of combustion systems and air intakes over a range of speed, altitude and incidence. A demonstration last week showed the effect of incidence on a test ramjet. In this test, in which sensors were being used to detect normal shock position, combustion in the motor ceased at an incidence of 10°.

Supersonic intake research at the Establishment is applicable to both ramjets and turbojets. A straight-tapered convergent/divergent intake with internal compression was demonstrated. A two-dimensional intake of this type has a kinetic-energy conversion efficiency of about 94%. It is hoped to produce even more efficient intakes which combine both internal and external compression.

The subjects surveyed here cover only some of the N.G.T.E. activities which were exhibited last week—and these in turn were a mere cross-section of its work. The scale of its test facilities and the wide range of its research programmes are very impressive. As a whole, British aero-engines are more widely renowned and adopted than British aircraft. The N.G.T.E. must share credit for their success, and its current work will help maintain their position in future.—J.R.C.

Book Reviews

"GREAT AIRCRAFT." By Wg. Cdr. Norman Macmillan, O.B.E., M.C., A.F.C. 304 pp.; 5¼ in. by 7¼ in.; illustrated. Bell. Price 21s.

THIS is a book that had to be written and not many people could have undertaken the task. Wg. Cdr. Macmillan's life has made him eminently suitable to be the one to do so. As he says, we are at a parting of the ways. It is not a paradox to say that although the pace of aeronautical progress is, if anything quickening, the future lies with specialized vehicles that will probably no longer be called aircraft plain and simple. They will be referred to as airline transports, feeder liners, executive aircraft, missiles, etc.

The author's choice of aircraft is, naturally, his own. Others might have been chosen: the Hart instead of the Fox, or the Hurricane instead of the Spitfire, and it is perhaps strange that the DC-3 is omitted from a list which includes the Parnall Pixie. The 10 aircraft chosen are the Wright Flyer, Camel, Vimy, Pixie, Fox, Spitfire, Superfortress, Canberra, Viscount and Comet.

Reading about these aeroplanes brings to mind the thought that this country lacks an aircraft museum. Interest in the subject is stirring, but unless there is some positive action soon it will be too late.

A very detailed account of the Wright Flyer is properly included. Surely the Wright Brothers were the greatest aeronauts, being aircraft and engine designers, aerodynamicists and pilots, and also because they solved the great problem of control which many of the other pioneers did not know existed. It is interesting to learn also that their factory was 1,000 miles from their flying field. This chapter exemplifies an attractive feature of this book: the reader is shown both the wood and the trees, the broad sweep of aeronautical progress and a dimensioned drawing of the Flyer's wing construction. The detail is interesting and apposite, for all who are connected with aircraft must, unlike politicians, be practical people. But the author has done well to integrate narrative and technical detail together with many well-depicted personal portraits. Most of the great names of this epoch appear from Sir John Alcock to General Arnold, from Fred Sigrist to Rex Pierson.

The author has achieved the considerable clarity of style which this book demands and it is easy reading. A slightly irritating insistence on the past tense obtrudes in places ("the atmospheric pressure of almost 15 pounds to the square inch at sea-level was reduced at 40,000 ft. to about 2¼ pounds") and there is the odd error ("aerial direction finding") and solecism ("preprototype"). Also, it is doubtful if a B-29 landed as slowly as a B-17. But the whole broad picture of this unique period of aviation is very true. "Great Aircraft" is a fascinating book and, if not a classic, will find a place on the historian's shelf. C. G. B. MCC.

"NORTH FLIGHT." By W. D. Pereira. 191 pp.; 5 in. by 7½ in. Robert Hale. Price 10s. 6d.

THE main action of this novel takes place in a Scandinavian country—Norden. An initial attempt to supply the Royal Nordish Air Force with home-designed Troll fighters has not been successful and the Nords have equipped with British Demon jet fighters, as used in the R.A.F. A series of fatal accidents to those machines calls for the grounding of all Nordish Demons pending a full-scale Court of Inquiry.

From England come representatives of Wand Aircraft, Albion Engines, and Sprig Fuel Systems.

In general, the story is that of Bill Lane, a young engineer sent by the Sprig firm to attend the Inquiry in Norden on its behalf. Alas, he has practically no briefing and soon finds that there is much more in question than the possible failure of fuel pumps. High politics lurk in the background: General Hammarling, the power in the land; Wand Aircraft trying not only to continue the supply of Demons, but to cut out American attempts to introduce an intermediate range rocket and then supply their own instead; the makers of the Troll, trying to get back into the market.

Although all three British firms deal through a common agent it becomes evident that they are not working in harmony, each trying to pass the blame for the failures on to one of the others. It had been fairly common knowledge that the Nordish aircraft had suffered severely from fuel contamination and consequent faults in the Sprig fuel pumps are the main suspects. Bill Lane is lucky to have the advice of the experienced Albion Engines expert—a Scotsman, naturally—in the final solution of the affair. As may be expected in a dictator country, agents are set to work to watch the British visitors.

Mr. Pereira has several novels to his credit which makes it peculiar that this story should have a vaguely amateur flavour. The plot is a good one but, perhaps because of the author's engineering training, it is somewhat overloaded with unnecessary detail; some of the technical descriptions might well have come direct from an elementary instruction manual. The real trouble seems to be that there is not enough solid basis in the heart of the plot—the Court of Inquiry: the reader is led down too many sidelines and could suspect a fair amount of padding up. This is not to say that the book is uninteresting; far from it; several untoward developments keep the pace going well.—R.O.

Surveillance from Orbit

After the Midas missile-detection satellite, launched on May 24, the U.S.A.F. are planning to launch the first Samos reconnaissance satellite into a polar orbit. Here, KENNETH GATLAND *reviews possible international repercussions.*

THE U.S. Air Force has made no secret of the fact that shortly it intends to launch the first Samos reconnaissance satellite into a polar orbit. Indeed, had the base facilities at Point Arguello in California been completed according to schedule, the prototype vehicle would have been launched this summer; latest reports are that this is now more likely to occur towards the end of the year.

One of the big hopes of the Samos reconnaissance system is that it will "fix" the position of important ground targets more accurately than is possible on conventional maps. Whether it will also be able to locate missile sites and smaller "point targets" is a matter for conjecture. If it achieves these objects will it be regarded as offering the same kind of challenge to Soviet sovereignty as the U-2 reconnaissance aircraft lost over Russia on May 1?

If present arrangements are allowed to proceed, the first Samos satellite should be in orbit over the poles before the end of the year, and since this orbit will carry it across Soviet territory—and indeed every part of the World—its mission is unlikely to pass without comment from the Soviet Union.

Problem of Space Law

Of course, the Americans could abandon the idea of polar launching during the period of trials, and launch instead from Cape Canaveral on a path which does not cross the Soviet Union. This was done in the case of the Midas missile-detection satellite, launched on May 24, which pursues an orbit inclined 28° north and south of the equator. However, there have been longstanding arrangements for polar launching of Samos which not only involve special facilities at the Point Arguello launching base but also the siting of special tracking and data acquisition stations.

Moreover, there is almost certain to be pressure from U.S. military quarters suggesting that Samos is a perfectly "legal" method of putting into effect an Open Skies policy since, according to the existing structure of international law, an artificial satellite cannot be said to violate the airspace of sovereign territories.

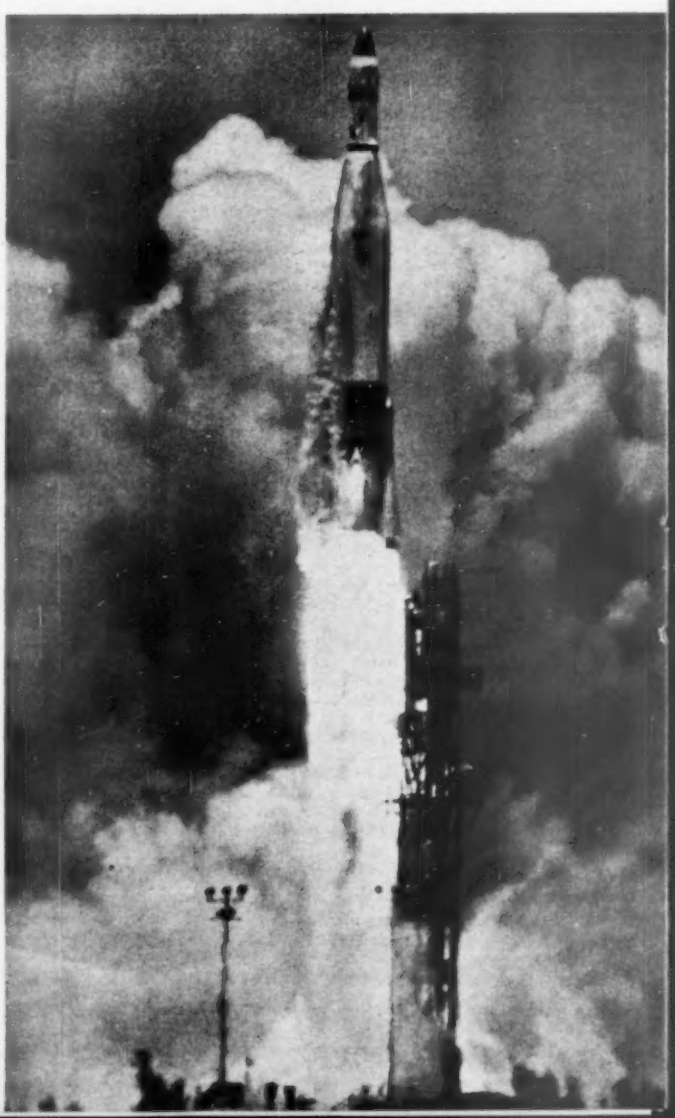
What, then, is the present position? Before the First World War, it was made a condition by Britain and Russia that it was necessary to obtain permission from the respective governments before an aircraft could fly over any part of their territories; and during the War itself, all nations came to regard such intrusions as breaches of sovereignty. Eventually, in 1919, the sovereignty of the airspace above a State was formally recognized by international agreement signed in Paris. This was subsequently confirmed under the Chicago Convention in 1944 which at the present time regulates the passage of aircraft about the World. The definitive words regarding sovereignty is that, according to Article 1, "The contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory."

With the arrival of the first space-vehicles, the limitations of the Chicago Convention have become apparent in that it covers only flight in the atmosphere, or airspace, by "aircraft," and does not define how far this region extends.

Thus, legally, America has every right to launch reconnaissance and surveillance satellites over the territories of other nations, although the wisdom of so doing at the present critical period of international diplomacy is open to question. If photographic and radar observation of the ground from an artificial satellite can be made half as effective as photography from a high-flying aircraft, it is not difficult to appreciate that this technique will have a good deal to commend it as a method of reconnaissance. Moreover, if satellites can effectively pin-point the launching of ballistic missiles from foreign territory, it could mean that not only would it be possible to obtain advance warning of ICBM attack but that every large rocket Russia test-fired would immediately be revealed to Western military authorities.

One cannot help wondering how Russia would react to this kind of 24-hour surveillance and what specific political repercussions may result.

Certainly the fact that artificial satellites have been regularly traversing "foreign" territories since the launching of Sputnik I on Oct. 4, 1957, does not imply that the operation of military satellites would be allowed to continue without redress merely because they are effectively "above the law." All the satellites which have gone into orbit to date, with the exception of Midas, have been justified on scientific grounds.



Launching of the experimental missile-detection satellite, Midas II, from Cape Canaveral on May 24. Its orbit does not pass over the Soviet Union.

beginning with the requirements of research carried out during the International Geophysical Year. No objection has been raised by any nation to the passage of these satellites.

However, the situation is changing radically and it is not that the only consideration is the operation of reconnaissance and surveillance satellites, for boost-glide orbital vehicles of the Dyna-Soar class are being developed to supplement the rôle of the surface-launched ICBM. It would be most unlikely if this work did not find its counterpart in Russia, although the writer is not aware of anything published in the Soviet Union on the use of outer space for other than "peaceful purposes."

No General Agreement

Clearly, the time is overdue when this problem should receive urgent consideration by some international body, preferably under the ægis of the United Nations. A move in the right direction appears to have been made by the International Astronautical Federation which, in London last year, formally approved the formation of an Institute of Space Law. A committee was set up under the chairmanship of Mr. Christopher Shawcross, Q.C., with Mr. Andrew Haley, the distinguished American authority on international law, as Secretary, to bring further recommendations before the Council of the I.A.F. when it meets this year in Stockholm.

Although such bodies as the I.A.F. can make recommendations for action on an international level, they can be little more than "talking shops" unless—as in all matters of international diplomacy—there is goodwill on all sides and a true desire to find a solution.

Quite apart from political issues, however, there is by no means general agreement among the lawyers and jurists on exactly how a "law of outer space" could be brought into effect. The basic problems were discussed at length by Sir William Hildred and Sir Frederick Tymms in a paper entitled, "National Sovereignty in Space," in THE AEROPLANE on May 23, 1958. In this the authors drew attention to the dangers of a geometric definition of the boundary between airspace and space. "We believe," they said, "that the extension of national sovereignties beyond their present recognized limits would add one more to the causes of conflict in an already overburdened World. . . ."

The whole question, of course, turns on the particular definition we give to "airspace," and the effective reach of the atmosphere. The Canadian authority on air law, Mr. John Cobb Cooper, who is adviser to the International Air Transport Association, has suggested that since nations have not protested against the operation of I.G.Y. satellites, this has established a precedent on the freedom of space. That is to say, the present national boundaries could be regarded as extending upward only to a point where the atmosphere ceases to provide lift for aircraft and balloons. Thus, outer space, beginning above this region and being unable to produce drag or otherwise affect flight, may be reckoned as beyond the sovereignty of any nation. However, the "fringe area" between these two regions would still require a definition of sovereignty through some kind of international agreement.

Needless to say, the precise limits of the fringe area are the most important considerations since it is just this region where the most potent military vehicles may be expected to operate—that is, boost-glide vehicles gaining a large component of their "lift" from centrifugal force in temporary orbits.

The zone of interest may even extend to less temporary satellites which remain in low-altitude orbits for weeks or even months and yet, at the same time, are effectively influenced by air drag and ultimately spiral back to Earth. These are the very orbits which have been chosen for reconnaissance and surveillance missions.

To attempt to bring the latter vehicles into the framework of international law is extremely difficult. In October, 1957, a Soviet jurist, G. Zadoroshnyi, argued that it is not the satellite which penetrates the space areas of various countries but rather that these space areas put themselves temporarily within the orbit of the satellite by virtue of the Earth's rotation. This is rather like a man, arrested for shooting ducks out of season, protesting that he had not shot the ducks but that, on the contrary, *they* had flown into his bullets!

A passage from Mr. John Cobb Cooper's paper before the "First Colloquium on the Law of Outer Space," held under the auspices of the I.A.F. at The Hague in 1958, seems to present the most realistic view of the air law/space law problem. "Many jurists are convinced that it is impossible, or at least impracticable to agree on any definition of airspace, or to fix an outer boundary by new international agreement. They feel that it is much more practical to leave the legal situation as it stands in so far as the technical legal status of different areas of space is concerned, and to direct efforts toward international understanding as to the conduct of high altitude flight generally, or as to particular flight or categories of flight instrumentalities. For example, it has been suggested that as an early step, each State about to launch a satellite could register its intent to do so with an international agency and furnish technical data. Agreement might be reached to refrain from using certain instrumentalities, or use them only under international inspection. If a gradual approach toward international control is thus developed, it is argued that no need exists to fix a definite upper boundary of State sovereignty."

These views, Mr. Cooper says, have been ably argued. They impel the jurist as well as the statesman to proceed with caution. A mistake made now in fixing an upper airspace boundary "might lead to grave future difficulties."

The Final Test

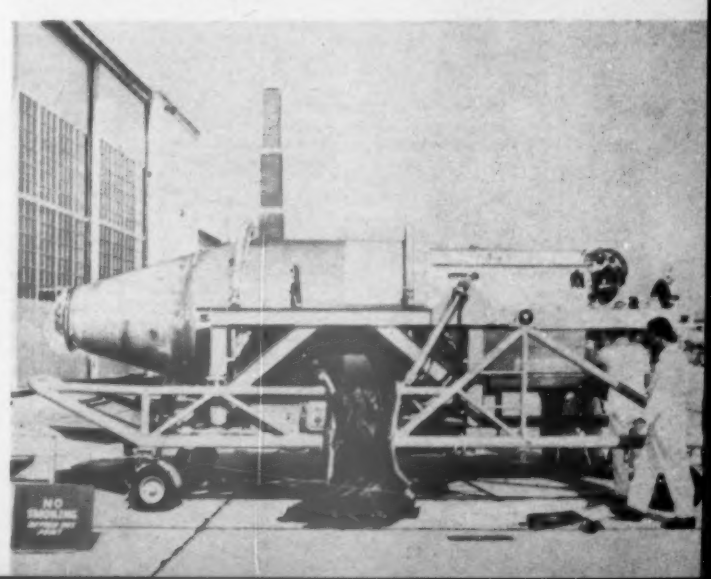
However, since these words were written, we have begun to see space-vehicles launched by the United States employing equipment which Russia and the Communist World are hardly likely to welcome. It is true that a chain of surveillance satellites is not yet operational in polar orbit, but it has been stated in America that it will be in two to three years. The problem of bombing from satelloid aero-space vehicles is more remote, but nevertheless still a problem for the present decade, according to the time-scale presented for Dyna-Soar.

As stressed earlier, there is no reason to believe that America is alone in developing the military satellite, despite Russia's silence on this subject. Nevertheless, in planning to launch Samos over the poles a test-case is being prepared by the United States to which Russia could reply in several ways.

Main possibilities seem to be: (1) Early experimental launchings, even polar, could be ignored on the grounds that they are not sufficiently effective; (2) Russia may seek action to prevent further launchings on the ground of provocation by the United States, through the United Nations; (3) Russia may consider it in her own interests to seek international control over the use of military devices in space on the lines suggested by Mr. John Cobb Cooper. This, however, would raise the long-standing problem of "inspection"; (4) Russia may reserve the right to destroy military satellites in orbit. (It is scarcely likely that it could be considered realistic to strike at the U.S. launching bases without precipitating all-out nuclear war.)

If course 4 is adopted as realistic, what are the chances of a satellite being intercepted in orbit? In the test-firings the Russians made into the Pacific Ocean last January, it was claimed that the multi-stage rocket projected a dummy final stage nearly 8,000 miles, dropping it within 1.25 miles of the appointed target. If we accept this figure, it is clear that the Russians have the ability to place a missile within a few hundred yards of a point in space at, say, 300 miles. If they can also achieve the necessary timing accuracy—a close-orbit satellite moves at a speed of about 5 miles per second!—it might be possible to "snare" the satellite within the field of a nuclear fireball, triggered by a proximity fuse.

No one is likely to suggest such action as a lasting remedy but in the absence of a mutual desire to negotiate a proper settlement based on inspection, space might be regarded by Russia as an admirable—and eminently "safe"—theatre for a localized trial of strength.



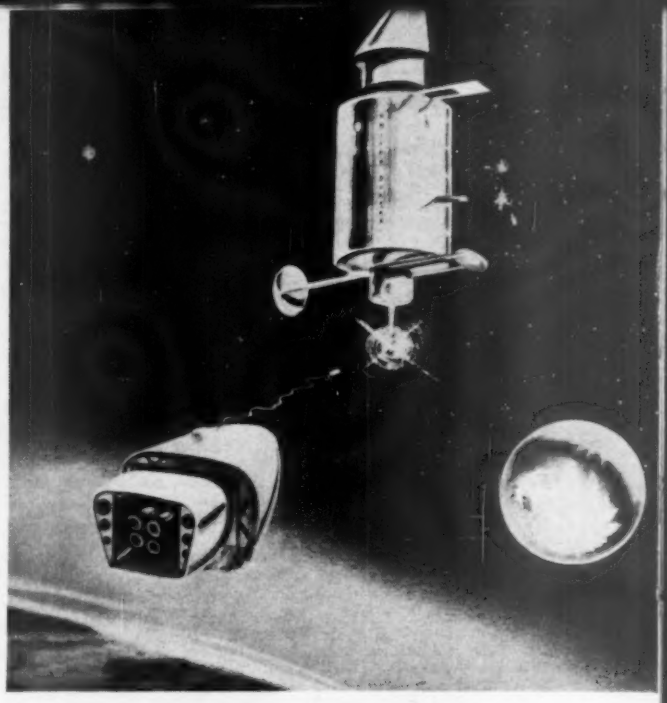
Reconnaissance of the entire World by means of satellites similar to the Lockheed Agena-B has been forecast by U.S. military authorities "within two to three years." How effective they will be is the subject of current tests.

Design for a Space-laboratory

NOW that the Russians have demonstrated the ability to orbit a satellite-spaceship of some 10,000 lb., a good deal of interest has been focused on the possible outcome of these developments in manned orbital flight. Clearly, the heavier payloads that will be launched into orbit over the next few years will permit more than the mere demonstration of sending a man into space, and practical developments, in the shape of small manned space-stations, may be regarded as a logical outcome.

Already, work on the giant Saturn space-booster of 1.5 million lb. s.t. gives a hint of the possibilities; fitted with liquid oxygen/liquid hydrogen upper stages, its payload capabilities for a 300-mile circular orbit are expected to exceed 25,000 lb. In company with the U.S.A.F. Dyna-Soar project, which aims to put a winged glider into orbit, these vehicles could form the basis of a development programme leading to the establishment of manned space-stations in the latter half of the present decade.

No doubt the need to put men in space for scientific purposes will be argued loud and long by the scientific fraternity, particularly in this country, but in Russia the space-scientists seem quite sure of their aims. For example, Sergei Vernov, a well-known Soviet physicist, writing in *Pravda*, points out that automatic equipment can detect only what was foreseen when it was designed; some scientific observations in space cannot be effected through radio signals. As an example, he mentions "one of the most interesting and important problems of modern physics—the interaction of high energy particles with atomic nuclei."



Artist's impression of the 16-ton "space-laboratory" in orbit at 400 miles. A re-supply vehicle, having matched speed in orbit, is about to "hook-up" on the station by means of an IR self-homing cable device.

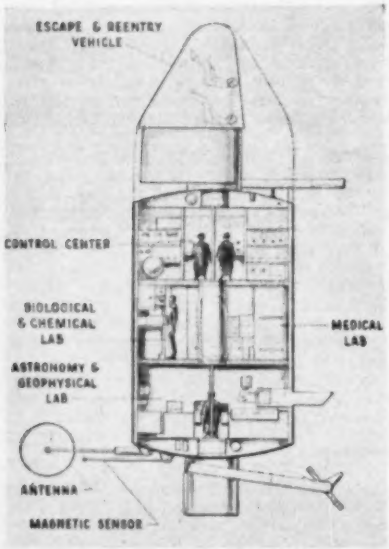


Diagram of the proposed "space-laboratory" which the Martin Company claims could be launched into orbit by 1965. Protrusions on the right hand side of the station are, top, parabolic mirror; centre, telescope; and bottom, telescope reflector.

Appearance of the three-stage launching vehicle, based on the NASA Saturn-class booster, for orbiting the 16-ton manned "space-laboratory."

Stressing the importance of observing these processes, Vernov points out that such experiments are now being carried out with the help of balloons sent up to great altitudes. These experiments, however, are hampered by the existence of secondary radiation in the stratosphere. Therefore, he says, the staging of such experiments in sputniks will be of great value and the task arises of obtaining photographs of atomic phenomena in outer space and bringing them safely back to Earth.

A Martin Proposal

However the arguments may flow between those who favour purely instrument research in space and others, like Vernov, who look upon man as an important adjunct of the instrument, it is obvious that a great deal of thought, both in the United States and Russia, is being given to the provision of an artificial environment for man beyond the atmosphere.

Mention has already been made of the successful symposium at which various designs of space-stations were discussed by leading U.S. aircraft and missile companies (THE AEROPLANE AND ASTRONAUTICS, May 27, p. 659). The illustrations on this page show a Martin proposal for a "manned shirt-sleeve environment laboratory," discussed at this symposium, which the authors suggest could be projected into orbit complete by a three-stage Saturn vehicle.

The pre-assembled laboratory, weighing 35,000 lb., and capable of maintaining four to six men in orbit for a year, would be placed in a 400-mile circular orbit to avoid the radiation problems at higher altitudes.

Presented by John W. Dorsey on behalf of his co-authors, Michael Stoiko and Gerald G. Kayten, the paper emphasized the importance of providing an environment in which the crew could perform their duties without the need for elaborate pressure-suits.

Dorsey described the space-laboratory as a double shell, three-compartment, cylinder with convex end domes. The outer shell, made of beryllium, would serve as a "meteor bumper" and thermal shield. The inner wall, of aluminium-alloy, would serve as the vehicle load-carrying component and container for the pressurized cabin.

The three components of the satellite-station would be separated by aluminium-alloy honeycomb bulkheads with air-locks, and cylindrical airlocks would be provided at each end of the vehicle for entry and exit, and to serve as "space environment test chambers."

Cabin atmosphere would be supplied by liquid oxygen and nitrogen. Conditioning units (one per chamber) would continuously circulate air at a temperature of 70° F. An automatic wall heat distributor system, using water-filled tubes attached

to and encircling the cabin wall, would require approximately 350 lb. of water, 275 lb. of basic hardware and a 500-watt power supply. The water reservoirs would also serve as heat sinks for the air conditioners.

According to the proposal, personnel occupying the station would be replaced at intervals of two to four weeks using variable-orbit satelloids capable of rendezvous missions. These would be launched by "advanced ICBM boosters now under development" (i.e., Centaur) and would bring food, equipment and supplies as well as replacement crews. A novel feature of the "docking" system is that the re-supply vehicle would employ an infra-red cable device which seeks a heat-source discharge from the base of the space-station.

The designers say the space-laboratory is based entirely on current technology and requires no further developments in propulsion, guidance or materials.

A Staged Black Knight

FIRST firing of a two-stage version of the Saunders-Roe/R.A.E. Black Knight upper-atmosphere research rocket took place at Woomera on May 24. When launched on a near-vertical trajectory, the solid-propellent top stage will ascend between 1,000 and 1,500 miles. On this occasion, however, the vehicle was fired on a lower trajectory and ignition of the second stage was delayed until it was about to re-enter the atmosphere, at 70 miles altitude, on the return path.

The Australian Minister of Supply, Mr. Alan Hulme, who announced the launching, said that it was part of the continuing programme of the British Government to obtain general scientific information concerning the upper atmosphere and re-entry problems. Mr. Hulme explained that the main stage of the rocket was deliberately kept at a lower altitude than in previous firings to ensure that, upon separation, the second stage would be stabilized on a downward path.

A primary object of the test was to investigate the re-entry properties of a "dummy" nose-cone which reached a maximum speed of 10,000 m.p.h. The nose-cone, which contained various instruments, was successfully recovered from the Australian desert and is being flown back to the R.A.E. for detailed examination. If it follows the practice of the larger single-stage nose-cone, it was fitted with a drogue device for reducing the impact velocity.

Last week's launching was the sixth in the Black Knight series, five earlier single-stage firings having been made to altitudes of between 300 and 500 miles.

Out of the Red

AS a result of a personal donation of £25,000 from Lord Nuffield and a further donation of £25,000 from the Nuffield Foundation, the Jodrell Bank radio-telescope is now clear of debt. Why this unique research instrument, which has brought this country so much prestige in space-research, has had to depend on private funds to make up the capital deficit of £50,000 has long been disquietening.

Although the total cost of the project was about £700,000, more than double the original estimate, it is a small price indeed for the lead it has given Britain in space tracking and communications. And there is also the yeoman work accomplished by Prof. Lovell's team of radio-astronomers in deep space and galactic studies—the original purpose of the instrument.

Construction of the 250-ft.-dia. radio-telescope began under grants from the D.S.I.R. and the Nuffield Foundation which left a total sum of £140,000 outstanding. Of this, more than £70,000 was raised by public subscription. Following the successful work done by the Jodrell Bank team in the tracking of the Sputniks and the early U.S. space-probes, NASA placed a contract with Manchester University whereby the radio-telescope was put "on hire" at £5 an hour in conjunction with the operation of American space-probes. The greatest triumph to date is the tracking and communications link achieved with the 94.8-lb. solar-probe, Pioneer V, millions of miles out in space.

Midas Aloft

FROM Cape Canaveral on May 24 came news of another successful satellite, Midas II, sent into orbit by a two-stage Atlas Agena-B. Midas means Missile Defence Alarm System; the satellite is equipped with a "super-cooled infra-red sensor" designed to detect the launching of hostile ICBM's from a 300-mile orbit.

In fact, a remarkably circular orbit was achieved with an apogee of 322 miles, a perigee of 292 miles, and a period of 94.3 min. The orbit is inclined at 28° to the equator, taking the vehicle as far north as the southern part of Communist China (but not the Soviet Union) and as far south as the tip of Africa.

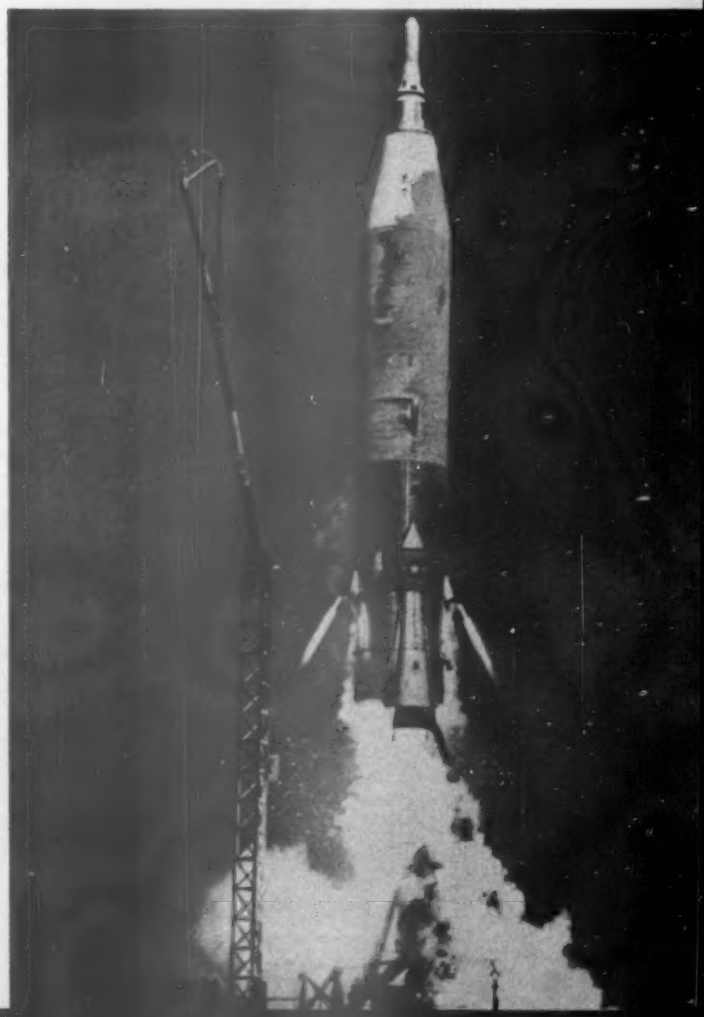
Launching was carried out by an Atlas delivering an initial thrust of over 360,000 lb. from its three engines. A coast period of about 10 min. followed cut-off of the main stage, whereupon the Agena-B top stage was injected into orbit by its own rocket engine of 15,000 lb. s.t. During the coasting phase, small helium gas-jets stabilized the Agena second stage and subsequently helped to orientate the vehicle into a nose-down attitude for operation of the IR sensors.

The instrument package aboard Agena-B (Midas) is about 3,600 lb., making a total mass of some 5,000 lb. in orbit. This represents the largest payload so far established in orbit by the United States and compares with 10,000 lb. recently launched by the Russians in their "satellite-spaceship."

As a test for the Midas equipment, the U.S.A.F. propose firing flares at Edwards A.F.B. and Vandenberg A.F.B. It is also reported that the Air Force might time the launching of ICBMs from Cape Canaveral to coincide with the passage of the satellite. The hope of these tests is that the sensors aboard Midas will be able to detect missiles as they pass out of the lower atmosphere, say at a height of some 50,000 ft. It is expected that sufficient sensitivity will be achieved to allow the space-borne detector to discriminate between missile firings and other heat sources on the Earth's surface.

Eventually, it is planned to have a whole range of military satellites in polar orbit to keep the World under constant surveillance. A three-part system is envisaged. Midas satellites will pick up hostile missile firings almost instantaneously; Samos reconnaissance satellites will provide television views of military installations, and Advent communications satellites will relay the various intelligence information to home bases.

At least, that is the theory. Much rests on the elaborate trials now beginning, and—as our article, "Surveillance from Orbit," discusses—on what the political repercussions are.



Launching of the Atlas ICBM on May 20 which projected a ballistic nose-cone a record distance of 9,000 miles from Cape Canaveral to a "target area" in the Indian Ocean.

The Fighting Services

Air Rank Appointments

AIR MARSHAL S. C. ELWORTHY, C.B.E., D.S.O., M.V.O., D.F.C., A.F.C., is to become C.-in-C., British Forces Arabian Peninsula, in succession to Air Chief Marshal Sir Hubert Patch, K.C.B., C.B.E., who is returning to the United Kingdom for health reasons. At present Deputy Chief of the Air Staff, Air Marshal Elworthy will take up his new appointment in August.

Air Vice-Marshal R. B. Lees, C.B., C.B.E., D.F.C., is to take over the post of Deputy Chief of the Air Staff at the Air Ministry next month, with the acting rank of Air Marshal. Senior Air Staff Officer, Fighter Command, since October, 1958, A.V.M. Lees was previously Assistant Chief of the Air Staff (Operations) from September, 1958. Prior to which he was A.O.C., No. 83 Group, 2nd Tactical Air Force, for three years.

The appointment of Senior Air Staff Officer, Fighter Command, has been taken over by acting Air Vice-Marshal E. L. Colbeck-Welch, C.B.E., D.F.C., who was previously S.A.S.O. at Headquarters, No. 13 Group. Before going to No. 13 Group, he was Commandant of the Central Fighter Establishment for two years.

Air Cdre. W. S. Gardner, C.B., C.B.E., D.F.C., A.F.C., until recently Head of the Plans, Training and Operations Division of the Central Treaty Military Planning Organization, has been appointed Provost Marshal at the Air Ministry. Senior Air Staff Officer at Air Headquarters, Levant, before joining the staff of the Baghdad Pact (as the Central Treaty Organization then was), he was previously C.O. of R.A.F. Kirton-in-Lindsay.

Non-stop Singapore

A VICKERS Valiant B (K).1 of No. 214 Squadron (Wg. Cdr. M. J. Beethan, D.F.C., A.F.C.) flew from R.A.F. Marham on May 25 non-stop to Singapore, a distance of 8,110 miles, in 15 hr. 35 min. Piloted by Sqn. Ldr. J. H. Garstin, the V-bomber was flight refuelled by Valiant tankers operating from Akrotiri, Cyprus, and Karachi.

The return flight from Malaya to the United Kingdom was also to be made non-stop. The Valiant was due to leave R.A.A.F. Butterworth on May 31 for Marham (7,760 miles) and again be refuelled over Karachi and Akrotiri.

No. 214 Squadron has already made many long-distance flights using air-to-air refuelling. Non-stop flights to points in Central and South Africa have been undertaken and in July, 1959, Wg. Cdr. Beethan completed the first non-stop flight to Cape Town—6,060 miles—in 11 hr. 28 min. Last February he flew a Valiant non-stop to Offutt, Nebraska (4,336 miles), refuelling over Labrador, and also flew non-stop back to Marham.

A Successful Operation

THE rescue of a Javelin crew from the North Sea on May 21 during the recent annual Fighter Command air defence exercise again illustrated that training, planning and co-operation pay the highest dividends. Ejecting after their aircraft had collided with another Javelin, the crew came down in the sea between 40 and 50 miles out and were located by a Shackleton 2 of No. 42 Squadron (Wg. Cdr. J. R. Ramsden, A.F.C.) flying on special S.A.R. patrol for the exercise.

At 14.20 hrs. the Shackleton intercepted a "Mayday" call resulting from a mid-air collision of two Javelins. Course was set for the distress position and at 14.30 hrs. some wreckage and oil was sighted in the sea, but no survivors could be seen. Approximately 10 minutes later, in response to a message from the Rescue Co-ordination Centre, the aircraft set course for a more accurate distress position. Whilst doing this, two distinct and separate signals were detected by the Shackleton on its Sarah receiver.

A successful Sarah homing was then made which resulted in the location of two survivors adrift in their personal dinghies. Two sets of Lindholme gear were dropped to the survivors, and two helicopters from Middleton St. George were homed to the scene. This action proved entirely successful and both survivors were safely aboard these helicopters by 16.55 hrs. The Shackleton then escorted the helicopters to their base, where the survivors were safely landed at approximately 17.15 hrs.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Wg. Cdr. E. P. Landon, D.F.C., and Wg. Cdr. G. L. Cochrane to the Departments of the Chief of the Air Staff and the Air Member for Supply and Organization respectively.

Bomber Command: Wg. Cdr. D. Bower, O.B.E., A.F.C., to Headquarters, No. 1 Group, for operations duties; Wg. Cdr. W. J. Knowles to the Bomber Command Armament School, Wittering to command; Wg. Cdr. K. J. Powell to R.A.F. Feltwell to command the Technical Wing.

Fighter Command: Gp. Capt. R. N. H. Courtney, D.F.C., A.F.C., to R.A.F. Leconfield to command; Wg. Cdr. the Hon. M. C. Adderley, A.F.C., to R.A.F. North Coates for operations duties; Sqn. Ldr. G. Young, to R.A.F. Stradishall as Senior Technical Officer, with acting rank of Wg. Cdr.

Coastal Command: Wg. Cdr. P. L. Lamb to R.A.F. North Front, Gibraltar, as Senior Dental Officer.

Transport Command: Wg. Cdr. F. J. French, O.B.E., D.F.C., A.F.C., to R.A.F. Colerne to command the Administrative Wing.

Flying Training Command: Wg. Cdr. J. L. W. Ellacombe, D.F.C., to R.A.F. Linton-on-Ouse to command, with acting rank of Gp. Capt.; Wg. Cdr. R. L. Fuller, A.F.C., to Headquarters as Deputy Senior Personnel Staff Officer.

Technical Training Command: Wg. Cdr. C. Parmee to R.A.F. Halton as Senior Dental Officer; Wg. Cdr. P. A. Askew to R.A.F. Uxbridge as Specialist Dental Officer.

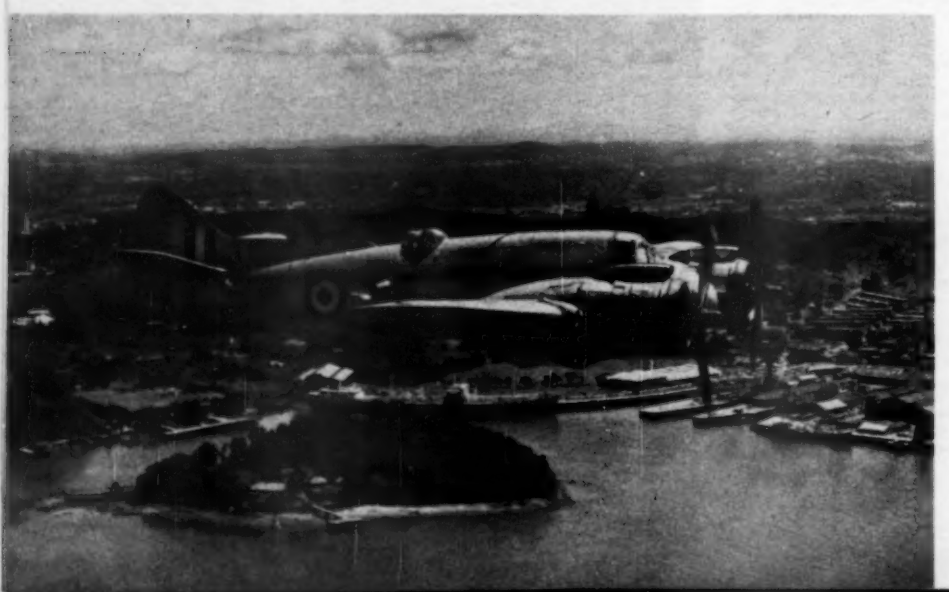
R.A.F. Germany: Gp. Capt. J. T. Shaw, D.S.O., D.F.C., A.F.C., to Headquarters as Gp. Capt. in charge of Organization; Wg. Cdr. J. Harris, D.F.C., to R.A.F. Wildenrath to command the Flying Wing; Sqn. Ldr. A. F. Peers, D.F.C., to R.A.F. Geilenkirchen to command No. 3 Squadron, with acting rank of Wg. Cdr.

Middle East Air Force: Sqn. Ldr. P. A. Knapton, D.F.C., to No. 280 Signals Unit, Cape Gata, Cyprus, to command, with acting rank of Wg. Cdr.; Rev. E. G. Alsop, to Headquarters as Assistant Chaplain-in-Chief.

A Nostalgic Occasion

TO celebrate the 40th anniversary of the formation of No. 2 School of Technical Training (Boys) at Cranwell in 1920, a special reunion of the 1st and 2nd Entries of Boys (i.e., those who joined in February and September, 1920) has been organized by Air Cdre. H. E. Nowell, C.B., O.B.E., R.A.F. (Retd.). To be held at the Apprentices School at R.A.F. Halton on Friday, Jne. 10, it will start at 14.30 hrs. with a conducted tour of the station. This will be followed by a showing of films and slides in one of the dining halls and a dinner in the Officers' Mess, Halton House, in the evening.

(*Continued on page 683*)



LAST FLIGHT.—Bristol Beaufighter RD 761 of Station and Target Towing Flight, R.A.F. Seletar, flown by Flg. Off. H. Marshall on its final trip round Singapore island last month. Within a few hours of this photograph being taken RD 761 was being reduced to scrap, bringing to a close 20 years of Beaufighter flying with the Service.

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AND HAVE BEEN CHOSEN FOR THE VICKERS VC.10s OF—

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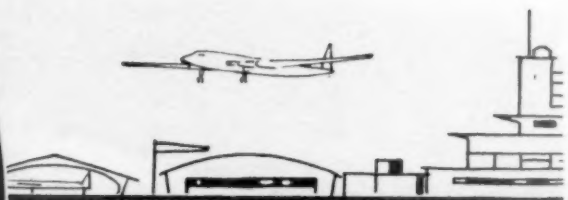

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FLIGHT REFUELLING.—Two Bomber Command Valiants demonstrating probe-and-drogue flight refuelling. As recorded on page 682, a No. 214 Squadron Valiant has flown non-stop to Singapore with the aid of this technique in 15 hr. 35 min.

(*Continued from page 682*)

Altogether some 75 ex-apprentices are expected to be present, together with a number of the original Staff Officers and some of the present staff of R.A.F. Halton. Former Cranwell officers who hope to attend include Air Chief Marshal Sir Leslie Hollinghurst, Air Cdre. C. R. Cox, Gp. Capt. R. J. F. Barton and Wg. Cdr. R. C. Preston.

The ex-apprentices have been asked to bring any photographs, cartoons, etc., that they may have of early Cranwell times to help them in their reminiscences. So far, Air Cdre. Nowell, who can be contacted at Norwich House, 4 Dunraven Street, Park Lane, London, W.1, has been unable to get into touch with any of the former senior N.C.O. instructors.

The R.A.F. "At Home"

THIS year 25 R.A.F. stations in the United Kingdom are to be open to the public on Saturday, Sept. 17, as part of "Battle of Britain" week. These are:—

Buckinghamshire: Halton; **Cambridgeshire:** Waterbeach; **Devonshire:** Chivenor; **Hertfordshire:** Bassingbourn; **Isle of Man:** Jurby; **Kent:** Biggin Hill; **Lincolnshire:** Waddington; **Norfolk:** Coltishall; **Northern Ireland:** Aldergrove; **Northumberland:** Acklington; **Oxfordshire:** Benson; **Rutland:** Cottismore; **Scotland:** Kinloss and Leuchars; **Shropshire:** Cosford and Shawbury; **Suffolk:** Wattisham; **Sussex:** Tangmere; **Wales:** Valley and St. Athan; **Warwickshire:** Gaydon; **Wiltshire:** Colerne; **Yorkshire:** Finningley, Leconfield and Norton.

At the 31 stations open last year over a million people attended.

More Service News

Reid Trophy.—Durham University Air Squadron won the Reid Trophy competition for the third successive year on May 21. Held at R.A.F. Manby, the results were Durham U.A.S. 74.4 points, Hull U.A.S. 69.7, Leeds U.A.S. 65.3, and Nottingham 63.6.

Yeadon Air Pageant.—The annual S.S.A.F.A. International Air Pageant is being held at Leeds-Bradford Airport, Yeadon, on Whit-Monday, Jne. 6. Attractions include the Italian and No. 111 Squadron aerobatic teams, and an aerobatic display by Leon Biancotto flying a Nord 3202.

The R.O.C. in the Nuclear Age

FIVE years ago the Royal Observer Corps added the reporting of nuclear bomb-bursts and fall-out to their traditional rôle of spotting and plotting aircraft movements. With its close network of posts positioned strategically throughout the British Isles, the R.O.C. continues to share with the R.A.F. a responsibility as Britain's first line of defence.

With most modern combat aircraft operating at heights where only radar can detect them, the identification and plotting of hostile aircraft are likely to be limited, in an attack on this country, to low-flying "Rats," as they are code-named, which might sneak in beneath radar perception.

Exercise "Dust Bowl," for examining operational and liaison problems posed by fall-out, was held on May 20-21 in conjunction with the R.A.F.'s participation in Exercise "Yeoman," which pitted our defences against an air "attack" by NATO aircraft. During the exercise a visit to Watford showed that No. 5 Group's operations room, or centre, is going underground like other centres. Each of the R.O.C.'s 31 groups has its centre which is in contact with up to about 50 posts spaced 8-10 miles apart.

The operations-room layout remains basically unchanged. Men and women plotters, around a plotting table, receive information from posts and display informative counters on the table. This information is interpreted by controllers and tellers in a balcony, and they communicate their information to a Fighter Command sector operations centre who decide what action is needed against identified hostile aircraft.

Also in the balcony are members of the Home Office Warning Organization, usually ex-R.O.C. personnel skilled in interpreting the plotting table's symbols. They pass information of nuclear action and fall-out to Sector Ops. also, where H.O. scientists assess the current and probable future situation for Home Defence information and action.

All this information originates in the nation-wide observer-post system of the R.O.C. which, to suit its dual rôle, now has two types of post. Spotting and reporting aircraft movements are done, as previously, at above-ground posts. But once there is a nuclear explosion, the observers move to the new underground posts, equipped with bunks, air filter, food, lavatory, etc., and providing complete cover from radiation.

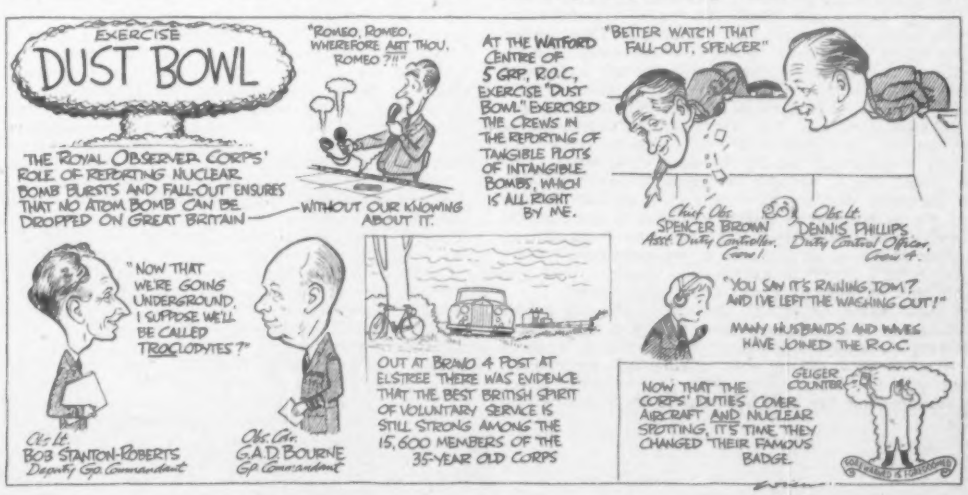
Three kinds of instruments are used to collect the necessary information on a nuclear attack:—

GROUND ZERO INDICATOR: Records the bearing of the explosion. Several bearings from a cluster of posts can thus fix the position of the bomb's explosion on the ground or in the air.

BOMB PRESSURE INDICATOR: Records the weight of the bomb.

BOMB SURVEY METER: A battery-operated instrument used to measure the radiation dose-rate outside the post. Both latter instruments are remotely read within the posts.

The R.O.C. maintains its vital place in the country's defence. It offers interesting work in a sociable atmosphere for volunteers who get an annual grant and travelling expenses. More volunteers of both sexes, between 15 and 55, are needed. The Corps deserves to get them.—WREN.


EXERCISE
DUST BOWL
THE ROYAL OBSERVER CORPS' ROLE OF REPORTING NUCLEAR BOMB BURSTS AND FALL-OUT ENSURES THAT NO ATOM BOMB CAN BE DROPPED ON GREAT BRITAIN
WITHOUT OUR KNOWING ABOUT IT.
"ROMEO, ROMEO, WHEREFORE ART THOU, ROMEO?!"
AT THE WATFORD CENTRE OF 5 GRP, R.O.C, EXERCISE "DUST BOWL" EXERCISED THE CREWS IN THE REPORTING OF TANGIBLE PLOTS OF INTANGIBLE BOMBS, WHICH IS ALL RIGHT BY ME.
"BETTER WATCH THAT FALL-OUT, SPENCER"
Chief Obs. SPENCER BROWN Asst. Duty Controller, Group 1
Obs. Lt. DENNIS PHILLIPS Duty Control Officer, Group 4.
"NOW THAT WE'RE GOING UNDERGROUND, I SUPPOSE WE'LL BE CALLED TROGLODYTES?"
Obs. Lt. BOB STANTON-ROBERTS Deputy Gp. Commandant
Obs. Cdr. G.A.D. BOURNE Gp. Commandant
OUT AT BRAND 4 POST AT ELSTREE THERE WAS EVIDENCE THAT THE BEST BRITISH SPIRIT OF VOLUNTARY SERVICE IS STILL STRONG AMONG THE 15,600 MEMBERS OF THE 35-YEAR OLD CORPS
"YOU SAY IT'S RAINING, TOM? AND I'VE LEFT THE WASHING OUT!"
MANY HUSBANDS AND WIVES HAVE JOINED THE R.O.C.
NOW THAT THE CORPS' DUTIES COVER AIRCRAFT AND NUCLEAR SPOTTING, IT'S TIME THEY CHANGED THEIR FAMOUS BADGE.
GEIGER COUNTER
VOLUNTARY AND PROUD OF IT

Photograph copyright "The Aeroplane and Astronautics"

Flying the Piper Aztec

By John Fricker

EXECUTIVE operators in many countries of the World have found that the Piper Apache, as the cheapest and smallest of the American light twins, is ideal as an introduction to business flying, and provides an excellent means of progression to more advanced equipment. Its success is indicated by the total of some 1,700 delivered to date, with production continuing at an average rate of about one per day.

With the introduction, late last year, of the bigger Aztec, which has two 250 b.h.p. Lycoming O-540 flat-six engines instead of the 160 b.h.p. Lycoming flat-fours of the Apache, the Piper company can offer its own means of progression from the latter type, and at a price some $10,000 cheaper than its nearest competitor. Since the Aztec has so many common features with the Apache, their production continues jointly at the rate of two aircraft per working day, divided between them according to demand.

Although having the same wings and many other components, including the electrical and hydraulic systems, the Aztec is more than a scaled-up Apache. The centre fuselage has been redesigned and lengthened to provide a roomy cabin for a normal complement of five people, instead of the Apache's occasional five-seat arrangement, and with this load the Aztec can carry full fuel of 120 Imp. gal., full radio, and 135 lb. of baggage for its maximum range of 1,200 miles. So loaded, it can also climb to 7,400 ft. on one engine.

There is, as they say, therefore positively no deception about the Aztec's five-seat capability, and in this country there is no other light twin of a comparable size offering a 200-m.p.h. economical cruise within £4,600 of its £22,032 basic duty-paid price. Equally impressive are its single-engine capabilities, as visitors to the recent Shackleton sales week-end were continually reminded by its asymmetric climb-away after almost every take-off in the hands of Wg. Cdr. Tim Vigors, U.K. Piper dealer.

I can also vouch, with some feeling, for the Aztec's single-engine performance. Never, in the handling of any twin, have I been subjected to so many simulated engine failures at times which usually would have resulted in the utmost embarrassment. Sitting in the right-hand seat, Tim Vigors cut an engine on me without any warning at all just after I pulled the wheels off the ground on my first take-off; he did the same thing when I was pulling the Aztec steeply up into an incipient power-on stall, and he cut the inside engine while I was in a rate-four turn to port. True, we were relatively lightly loaded with three people on board and about half fuel, but the fact that I am able to report on these things at all is, perhaps, sufficient commentary on both the Aztec's excellent asymmetric qualities and Tim Vigor's confidence in these after very short acquaintance.

The first U.K. Aztec, G-APYX, arrived on the day before the Shackleton week-end, but spent most of the daylight hours of the following three days in the air. As mentioned, much of its flying was on one engine, but during my asymmetric acquaintance with the Aztec I can affirm that surprise, rather than apprehension, was my only reaction to these unexpected eventualities.

In addition to a useful power margin, the Aztec gains its single-engine qualities through the generous area of its dorsally extended fin and a rudder servo tab of larger than average proportions. This also doubles as a trim tab, actuated through the usual Piper low-geared crank system in the cockpit roof. Concentric with the rudder trimmer is a larger crank for longitudinal trim; although these controls are illogical in their siting and actuation, I am at last beginning to remember that you turn the elevator handle clockwise to "wind the nose up," and vice versa for tail-down trim.

Like the single-engined Comanche, the Aztec has very positive longitudinal control through a single-piece slab tailplane or "stabilator." It is claimed to require about 25% less area than a conventional tailplane and elevator, while providing improved low-speed control and, in conjunction with its nearly full-span anti-servo tab, better stability. No unusual characteristics from this design feature are detectable in flight. Like the rest of the airframe, the tail surfaces are all-metal stressed skin, although the cabin structure is built up on welded-steel tubes.

Except for the permanently installed fifth rear seat and its accompanying additional windows, the roomy and comfortable cabin of the Aztec is similar to the Apache in layout, as is the deep and well-planned instrument panel. In the centre is ample space for communications and navigational VHF equipment, flanked on the left by duplicated VOR/ILS indicators and the ADF dial. The Aztec, in fact, is designed to be electronically equipped virtually to airline standards, and is usually specified to have the 4-lb. AutoFlite single-axis automatic pilot.

Cabin access through the single starboard door is reasonably easy, and the excellence of the all-round view from the first pilot's seat is qualified only by the intrusion of the flat engine nacelles on visibility downwards and to each side. The Lycomings spring immediately into life after priming and a touch of the dual-pole starter switch, and a measure of the abundant cabin soundproofing which includes a ¼-in.-thick windscreen, is that their noise is less obtrusive than in the Apache, despite their outboard-mounted jet-augmented exhausts. The engines are fed from four 30-Imp.-gal. wing tanks in the outer wings, the Aztec having 33% more fuel than the Apache, but retains the same full cross-feed system.

Starting off from Kidlington by observing from the right-hand seat while Tim Vigors showed how the Aztec should be handled, I was greatly impressed by the speed of feathering displayed by the constant-speed Hartzell airscrews. After a vigorous initial acceleration we had unstuck at about 70 m.p.h., and as the undercarriage was selected "up," the pitch and mixture levers were swept aft in their centre quadrant to bring the starboard airscrew to an immediate stop.

Our height at the time was about 50 ft. and the landing gear was still half-extended, but the Aztec continued skywards without faltering at an indicated 500 ft./min. and 90 m.p.h. The manufacturers claim a single-engine climb at max. weight of 350 ft./min. at 110 m.p.h. Restarting the Lycomings in the

air is a slightly more prolonged process involving the use of the starter motor to turn the airscrew initially until about 500 r.p.m. is achieved. The starter units on G-APYX seemed to stand up very well to three days of concentrated single-engined demonstration flying, which demanded far more than their normal usage.

In a normal full-power climb at 28 in. Hg. and 2,550 r.p.m., and 110 m.p.h. I.A.S., the Aztec indicated nearly 2,000 ft./min. on the V.S.I. Cruise climb is at 130 m.p.h., with 24 in. Hg. and 2,400 r.p.m. At 1,000 ft. or so, Tim Vigors hauled the Aztec up on its tail until the speed fell to about 80 m.p.h. and then did the rapid-feathering trick with the starboard engine again. Although 80 m.p.h. is the nominal minimum control speed on one engine, the A.S.I. was allowed to fall to 70, with the stall warning light just beginning to flicker, and the Aztec could still be held straight by means of generous control-surface deflection.

Equally impressive as an asymmetric demonstration was the feathering of the port airscrew, from the normal cruise setting of 75% power (23½ in. Hg. and 2,350 r.p.m. at our fairly low altitude), hands and feet off the controls. The Aztec merely yawed and crabbed mildly, requiring no immediate correction to maintain level flight. Single-engine cruise speed is 135 m.p.h. After restarting, and re-establishing 75% power, the Aztec settled down to indicate about 184 m.p.h. at 1,000 ft. or so. At the rated altitude of 7,000 ft. this trues out at 205 m.p.h., for a fuel consumption of 23.3 Imp. gal./hr. A more economical cruise, at 65% power, returns 200 m.p.h. T.A.S. and 20 g.p.h. at 10,000 ft.

Moving over to the left-hand seat, I found the Aztec one of those aeroplanes which inspires an immediate feeling of confidence because of its comfort, practical layout and largely unobstructed view. That this confidence was not misplaced was demonstrated by the airscrew feathering sprung on me on my first take-off, when a very moderate foot load was all that was required against full asymmetric power to continue a straight climb. Slight aileron application also proved helpful in keeping up the wing with the dead engine.

I liked the balance of control harmony and stability in the Aztec, with the moderate forces one would expect from an aircraft of this size. The asymmetric rudder load could be comfortably held with no immediate need for retrimming and, in normal two-engined flight, the keynote of the Aztec is effortless operation. Except laterally, where it is neutral, the all-round stability is very positive, and the only marked changes of trim occur longitudinally with differing power and flap settings.

Throttling back for slow-speed flight requires a few turns of the tailplane trimmer to keep the nose up, or a strong pull force on the control wheel in lieu. To try the clean stall, I kept pulling until the speed fell to about 65 m.p.h. I.A.S. when the blinking of the stall warning light and a tremor of tailplane buffet heralded a very mild and straight breakaway some 5 m.p.h. later. Lateral control remained effective, although naturally soggier, and the stall was completely innocuous. Position error at the low end of the scale is from 10-15 m.p.h.

Limit speed for undercarriage extension is 150 m.p.h., and the flaps, 125 m.p.h. Little trim change accompanies landing-gear movement, but selection of flap by the lever on the central console is followed by a brisk nose-up effect. This is largely counterbalanced on reducing power, which simplifies approach procedures. Stalling in this configuration I found a matter of the warning light coinciding with fairly pronounced tailplane buffet at about 55 m.p.h. I.A.S., followed by gentle oscillations between 50 and 55. Continued aft pressure finally resulted in a straight drop at 45 on the A.S.I., although the true airspeed is then about 60 m.p.h. All the same, the Aztec must be reckoned to have particularly good slow-speed characteristics for an aeroplane of its performance class, and it is also unusual in having quite a degree of aerodynamic stall warning.

With such a pleasant aeroplane and in excellent weather conditions it was a great temptation to cruise gently about at our indicated low-level speed of 165 m.p.h., with a 21-in. Hg. and 2,250 r.p.m. power setting, and enjoy life. Tim Vigors was determined to make me work for my living however, and to leave me in no possible doubt about the Aztec's asymmetric qualities cut alternate engines in all sorts of exaggerated attitudes. Feathering an airscrew with the aircraft hauled up below its 80-m.p.h. minimum control speed did not result in the slightest loss of control; the loss of an inside engine in a steep turn merely required holding off some of the bank, and at all times there was a very welcome feeling of control power in hand.

After such a work-out the return to the circuit, which is often where you learn most about an aeroplane, was virtually a relaxation. The Aztec settled nicely in the groove downwind, with gear and half-flap down plus about 12 in. manifold pressure, to give a steady 600 ft./min. or so rate of descent at 95 m.p.h. Stability on the approach was impressive, and the ailerons remained potent enough to give a rate of roll of about 35 degrees/sec.—very reasonable for a two-ton twin.

I used a threshold speed of about 80 m.p.h., but on reducing power at the start of the flare-out the Aztec touched-down decisively slightly short of my aimed landing point. This is a useful feature for short landings, but on my second approach I found that a powered flare-out, instead of slight extra speed, gave a more controlled touch-down. At a touch-down speed of about 70 m.p.h., however, the landing roll is very short, and the big wheels give a pleasant ride on fairly rough grass.

For a 200-m.p.h. cruising aeroplane the Aztec has an excellent short-field performance and, like all the Piper range, gives the impression of being designed for regular operation from unprepared surfaces, rather than the almost-universal American paved runways. The plump nosewheel, which is steerable through a 30-degree arc from the rudder panels, gives very positive directional control for take-off and landing, and for taxi-ing results in a turning radius of 28 ft. The toe brakes on the port rudder pedals provide effective retardation through hydraulic disc units on the mainwheels.

All but the fifth rear seat in the Aztec are reclinable and adjustable fore and aft, and are fitted with removable headrests. The seat backs are contoured for the maximum comfort, and are upholstered in leather.

Standard equipment includes a 27,500-B.Th.U. Southwind combustion heater in the nose, which burns only a quart of the Aztec's 91/96 octane fuel an hour at maximum output. It has twin outlets in the front and in the rear cabin, plus two demister slots for the windscreen, and is typical of the high standard of equipment furnished with this $49,500 aeroplane.

Despite its low price tag, the Aztec gives no suggestion of an "economy" machine, and the standard of cabin furnishing is high. The seats, which are of the adjustable and reclining type, are upholstered in leather, with curved and contoured backs and detachable headrests, and the cabin sidewalls are panelled with a combination of leather and washable nylon upholstery. Heavy floor carpeting is laid over a rubber mat, and the cabin can be rapidly stripped for cargo or freight carriage.

On all counts—handling, performance, economy and practicability—the Aztec has a big future. It is a natural for executive operation and will also find favour with the discriminating and affluent private owner.

Leading Particulars

DIMENSIONS.—Span, 37 ft.; length, 27.6 ft.; height, 10.3 ft.; wing area, 207 sq. ft.

WEIGHTS (G-APYX).—Empty, including radio, 2,906 lb.; full fuel (120 Imp. gal) and oil, 909 lb.; disposable payload, 985 lb.; pilot and four passengers, each at 170 lb., 850 lb.; weight available for baggage, 135 lb.; max. baggage weight, 200 lb.; max. gross, 4,800 lb.

PERFORMANCE.—Max. speed, 215 m.p.h.; optimum cruise (75% power at 7,000 ft.), 205 m.p.h.; normal cruise (65% power at 9,000 ft.), 200 m.p.h.; initial climb, 1,650 ft./min.; single-engine climb, 365 ft /min.; service ceiling, 22,500 ft.; single-engine ceiling, 8,800 ft.; cruising range, 65% power, 1 200 miles; max. range (45% power at 10,000 ft.), 1,400 miles; take-off to 50 ft., 1,100 ft.; landing from 50 ft., 1,360 ft.

Photograph copyright "The Aeroplane and Astronautics"

Flying the Piper Aztec

By John Fricker

EXECUTIVE operators in many countries of the World have found that the Piper Apache, as the cheapest and smallest of the American light twins, is ideal as an introduction to business flying, and provides an excellent means of progression to more advanced equipment. Its success is indicated by the total of some 1,700 delivered to date, with production continuing at an average rate of about one per day.

With the introduction, late last year, of the bigger Aztec, which has two 250 b.h.p. Lycoming O-540 flat-six engines instead of the 160 b.h.p. Lycoming flat-fours of the Apache, the Piper company can offer its own means of progression from the latter type, and at a price some $10,000 cheaper than its nearest competitor. Since the Aztec has so many common features with the Apache, their production continues jointly at the rate of two aircraft per working day, divided between them according to demand.

Although having the same wings and many other components, including the electrical and hydraulic systems, the Aztec is more than a scaled-up Apache. The centre fuselage has been redesigned and lengthened to provide a roomy cabin for a normal complement of five people, instead of the Apache's occasional five-seat arrangement, and with this load the Aztec can carry full fuel of 120 Imp. gal., full radio, and 135 lb. of baggage for its maximum range of 1,200 miles. So loaded, it can also climb to 7,400 ft. on one engine.

There is, as they say, therefore positively no deception about the Aztec's five-seat capability, and in this country there is no other light twin of a comparable size offering a 200-m.p.h. economical cruise within £4,600 of its £22,032 basic duty-paid price. Equally impressive are its single-engine capabilities, as visitors to the recent Shackleton sales week-end were continually reminded by its asymmetric climb-away after almost every take-off in the hands of Wg. Cdr. Tim Vigors, U.K. Piper dealer.

I can also vouch, with some feeling, for the Aztec's single-engine performance. Never, in the handling of any twin, have I been subjected to so many simulated engine failures at times which usually would have resulted in the utmost embarrassment. Sitting in the right-hand seat, Tim Vigors cut an engine on me without any warning at all just after I pulled the wheels off the ground on my first take-off; he did the same thing when I was pulling the Aztec steeply up into an incipient power-on stall, and he cut the inside engine while I was in a rate-four turn to port. True, we were relatively lightly loaded with three people on board and about half fuel, but the fact that I am able to report on these things at all is, perhaps, sufficient commentary on both the Aztec's excellent asymmetric qualities and Tim Vigor's confidence in these after very short acquaintance.

The first U.K. Aztec, G-APYX, arrived on the day before the Shackleton week-end, but spent most of the daylight hours of the following three days in the air. As mentioned, much of its flying was on one engine, but during my asymmetric acquaintance with the Aztec I can affirm that surprise, rather than apprehension, was my only reaction to these unexpected eventualities.

In addition to a useful power margin, the Aztec gains its single-engine qualities through the generous area of its dorsally extended fin and a rudder servo tab of larger than average proportions. This also doubles as a trim tab, actuated through the usual Piper low-geared crank system in the cockpit roof. Concentric with the rudder trimmer is a larger crank for longitudinal trim; although these controls are illogical in their siting and actuation, I am at last beginning to remember that you turn the elevator handle clockwise to "wind the nose up," and vice versa for tail-down trim.

Like the single-engined Comanche, the Aztec has very positive longitudinal control through a single-piece slab tailplane or "stabilator." It is claimed to require about 25% less area than a conventional tailplane and elevator, while providing improved low-speed control and, in conjunction with its nearly full-span anti-servo tab, better stability. No unusual characteristics from this design feature are detectable in flight. Like the rest of the airframe, the tail surfaces are all-metal stressed skin, although the cabin structure is built up on welded-steel tubes.

Except for the permanently installed fifth rear seat and its accompanying additional windows, the roomy and comfortable cabin of the Aztec is similar to the Apache in layout, as is the deep and well-planned instrument panel. In the centre is ample space for communications and navigational VHF equipment, flanked on the left by duplicated VOR/ILS indicators and the ADF dial. The Aztec, in fact, is designed to be electronically equipped virtually to airline standards, and is usually specified to have the 4-lb. AutoFlite single-axis automatic pilot.

Cabin access through the single starboard door is reasonably easy, and the excellence of the all-round view from the first pilot's seat is qualified only by the intrusion of the flat engine nacelles on visibility downwards and to each side. The Lycomings spring immediately into life after priming and a touch of the dual-pole starter switch, and a measure of the abundant cabin soundproofing which includes a ¼-in.-thick windscreen, is that their noise is less obtrusive than in the Apache, despite their outboard-mounted jet-augmented exhausts. The engines are fed from four 30-Imp.-gal. wing tanks in the outer wings, the Aztec having 33% more fuel than the Apache, but retains the same full cross-feed system.

Starting off from Kidlington by observing from the right-hand seat while Tim Vigors showed how the Aztec should be handled, I was greatly impressed by the speed of feathering displayed by the constant-speed Hartzell airscrews. After a vigorous initial acceleration we had unstuck at about 70 m.p.h., and as the undercarriage was selected "up," the pitch and mixture levers were swept aft in their centre quadrant to bring the starboard airscrew to an immediate stop.

Our height at the time was about 50 ft. and the landing gear was still half-extended, but the Aztec continued skywards without faltering at an indicated 500 ft./min. and 90 m.p.h. The manufacturers claim a single-engine climb at max. weight of 350 ft./min. at 110 m.p.h. Restarting the Lycomings in the

air is a slightly more prolonged process involving the use of the starter motor to turn the airscrew initially until about 500 r.p.m. is achieved. The starter units on G-APYX seemed to stand up very well to three days of concentrated single-engined demonstration flying, which demanded far more than their normal usage.

In a normal full-power climb at 28 in. Hg. and 2,550 r.p.m., and 110 m.p.h. I.A.S., the Aztec indicated nearly 2,000 ft./min. on the V.S.I. Cruise climb is at 130 m.p.h., with 24 in. Hg. and 2,400 r.p.m. At 1,000 ft. or so, Tim Vigors hauled the Aztec up on its tail until the speed fell to about 80 m.p.h. and then did the rapid-feathering trick with the starboard engine again. Although 80 m.p.h. is the nominal minimum control speed on one engine, the A.S.I. was allowed to fall to 70, with the stall warning light just beginning to flicker, and the Aztec could still be held straight by means of generous control-surface deflection.

Equally impressive as an asymmetric demonstration was the feathering of the port airscrew, from the normal cruise setting of 75% power (23½ in. Hg. and 2,350 r.p.m. at our fairly low altitude), hands and feet off the controls. The Aztec merely yawed and crabbed mildly, requiring no immediate correction to maintain level flight. Single-engine cruise speed is 135 m.p.h. After restarting, and re-establishing 75% power, the Aztec settled down to indicate about 184 m.p.h. at 1,000 ft. or so. At the rated altitude of 7,000 ft. this trues out at 205 m.p.h., for a fuel consumption of 23.3 Imp. gal./hr. A more economical cruise, at 65% power, returns 200 m.p.h. T.A.S. and 20 g.p.h. at 10,000 ft.

Moving over to the left-hand seat, I found the Aztec one of those aeroplanes which inspires an immediate feeling of confidence because of its comfort, practical layout and largely unobstructed view. That this confidence was not misplaced was demonstrated by the airscrew feathering sprung on me on my first take-off, when a very moderate foot load was all that was required against full asymmetric power to continue a straight climb. Slight aileron application also proved helpful in keeping up the wing with the dead engine.

I liked the balance of control harmony and stability in the Aztec, with the moderate forces one would expect from an aircraft of this size. The asymmetric rudder load could be comfortably held with no immediate need for retrimming and, in normal two-engined flight, the keynote of the Aztec is effortless operation. Except laterally, where it is neutral, the all-round stability is very positive, and the only marked changes of trim occur longitudinally with differing power and flap settings.

Throttling back for slow-speed flight requires a few turns of the tailplane trimmer to keep the nose up, or a strong pull force on the control wheel in lieu. To try the clean stall, I kept pulling until the speed fell to about 65 m.p.h. I.A.S. when the blinking of the stall warning light and a tremor of tailplane buffet heralded a very mild and straight breakaway some 5 m.p.h. later. Lateral control remained effective, although naturally soggier, and the stall was completely innocuous. Position error at the low end of the scale is from 10-15 m.p.h.

Limit speed for undercarriage extension is 150 m.p.h., and the flaps, 125 m.p.h. Little trim change accompanies landing-gear movement, but selection of flap by the lever on the central console is followed by a brisk nose-up effect. This is largely counterbalanced on reducing power, which simplifies approach procedures. Stalling in this configuration I found a matter of the warning light coinciding with fairly pronounced tailplane buffet at about 55 m.p.h. I.A.S., followed by gentle oscillations between 50 and 55. Continued aft pressure finally resulted in a straight drop at 45 on the A.S.I., although the true airspeed is then about 60 m.p.h. All the same, the Aztec must be reckoned to have particularly good slow-speed characteristics for an aeroplane of its performance class, and it is also unusual in having quite a degree of aerodynamic stall warning.

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Racing and Rally

TODAY and tomorrow, Jne. 3-4, mark the staging of one of the biggest sporting flying events of the year, with the revival of the London-Cardiff air race, after an interval of 22 years, combined with Handicap Class races round a local circuit from Rhoose, and the 1960 Welsh Air Rally Display sponsored by the Glamorgan Flying Club. The cross-country race starts from White Waltham at 17.00 hrs. today, Jne. 3, and nearly 50 competing aircraft are due to fly the 113-st. mile course to Rhoose Airport, Cardiff.

It is to be hoped that the weather will be kinder than it was for the recent Air Touring Competition, and will remain so for the closed-circuit races on Saturday, which are round a diamond-shaped course of approximately 11 miles, starting and finishing at Rhoose. Three or four laps will be flown over this circuit in class races for the Air League, Norton-Griffiths and D.H. Tiger Moth Challenge Trophies. Apart from these prizes themselves, points will be awarded for each class in order of finishing to qualify for the King's Cup race on Jly. 8-9.

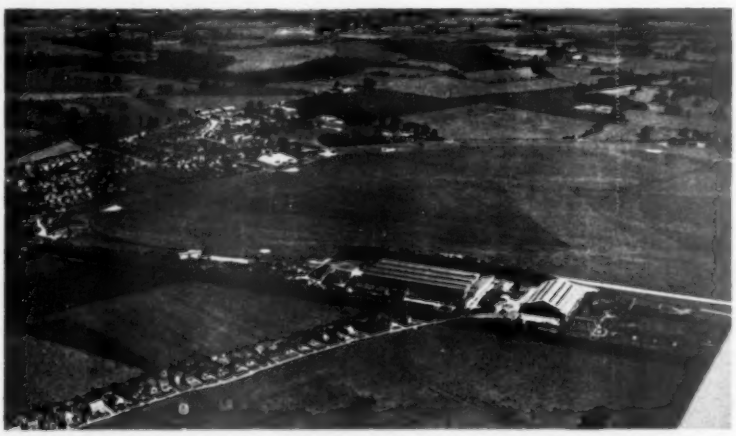
Saturday's programme will also include a full-scale flying display, and the meeting as a whole will be the largest, it is claimed, ever held in Wales. Among the many display items are the incomparable Hunter 6s of No. 111 Squadron, which has had an almost complete turnover of flying personnel since last year but has retained the excellence of its flying.

Details of the race courses will be apparent from the accompanying maps, and some of the pinpoints on the London-Cardiff route may be seen on the oblique photographs. If the visibility is as good as it was when these were taken on a recent sortie, competitors will find little difficulty in maintaining that close proximity to the desired track which is so essential in a race of this kind. With the prevailing westerly wind, however, low flying, within the legal limits, may be the order of the day, and restricted visibility may make accurate map reading additionally complicated.

Our aerial views show one or two of the landmarks to be seen on each side of the track line from about 1,500 ft. a.s.l. Despite the comparative lack of features on the rolling Marlborough Downs, in the middle section of the track, there are enough prominent pinpoints after leaving White Waltham to establish an accurate course quite rapidly, and the latter part presents no difficulty. Several disused airfields are crossed or passed in close proximity, and may provide useful bolt holes in case of overtaxed engines as well as prominent navigational features.

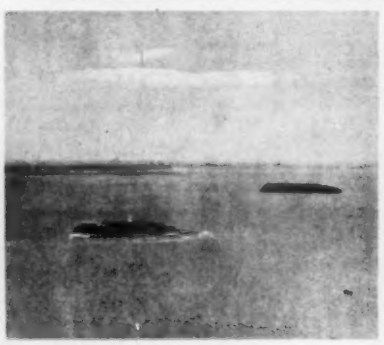
It will be noted from the accompanying map that the London-Cardiff route is not direct, but has been dog-legged south to avoid flying over Bristol and the Transport Command airfield of Colerne. Airfields, disused or otherwise, peter out on track after Ramsbury, where competitors will flank Savernake Forest before passing over Marlborough. They will then

The diamond-shaped course over which the closed-circuit races will be flown on Jne. 4.



Right, starting point in the London-Cardiff race is the Fairey Aviation airfield at White Waltham.

Barry docks, with their oil tanks and tankers, will tell competitors that they are nearly home.



In mid-Bristol Channel competitors will pass between the islands of Flat Holm and Steep Holme.

Soon after take-off competitors pass Sonning Lock, with a distant view of Woodley airfield.

Target airfield for the racing pilots is Rhoose, with a good selection of runways and grass strips.

Photographs copyright "The Aeroplane and Astronautics"

ing in Wales

H.R.H. The Duke of Edinburgh, here seen landing at White Waltham, has entered the Rollason Turbulent G-APNZ in the National Air Races with Sqn. Ldr. Severne as pilot.

be in a noted "white horse" area, and three of these chalk landmarks will provide prominent pinpoints in close proximity to the track.

The gentle plains of Wiltshire then change to rolling wooded countryside when the winding valley of the Avon is reached just before Bath, which competitors will skirt to the South. They then make for the reservoir below Bristol's Lulsgate airfield, and continue on for the turning point at Bleadon Hill. Leaving Weston-super-Mare on their right, they head off on a 12-mile crossing of the Bristol Channel, passing usefully between the appropriately named islands of Flat Holm and Steep Holme. Flat Holm (with no "e") is the one with the lighthouse. Landfall should be made at the tip of Barry Island, enclosing the town's busy docks, and then comes the finishing line at Rhoose. The two 1,000-ft. television masts north of the airfield may be useful as a general guide in good visibility; they should be too far away from the track line to be a hazard.

Entrants for the races range from diminutive Turbulents, including one entered by Prince Philip and flown by Sqn. Ldr. Severne, to such veterans as Vivian Bellamy's Spitfire Mk.8 and the surviving Fairey Fulmar, flown by John Fairey. In addition to the usual racing types, such as Proctors, Geminis, the Comper Swift, Chilton and Tiger Moths, there are several American newcomers, including the Cessna 175, 210 and 310, and a Currie Wot. Most of the pilots are well known in post-war air racing circles.

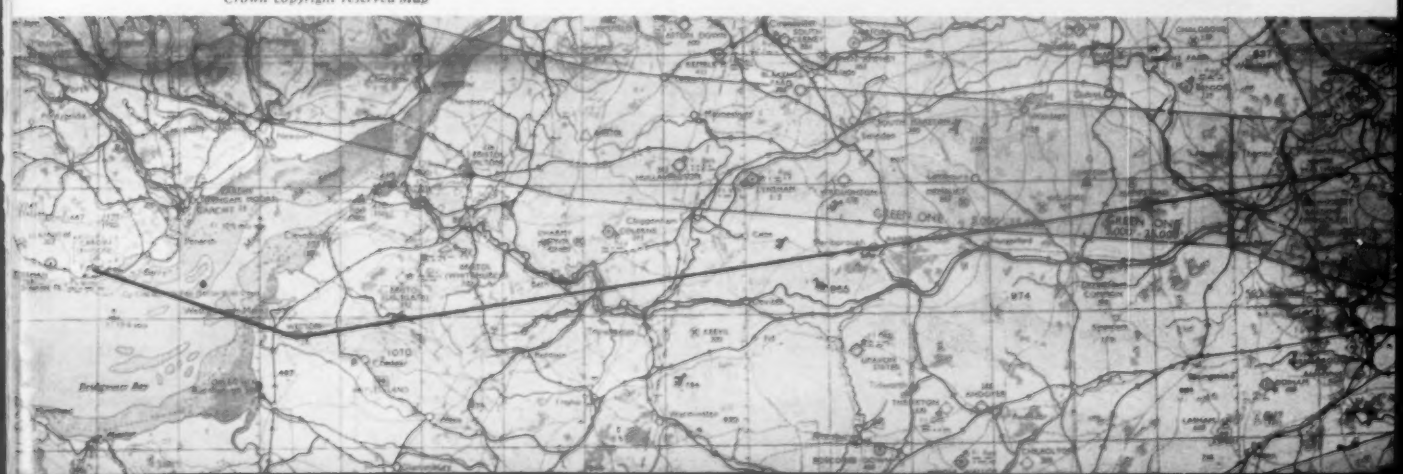
Following last year's achievement as British Air Racing Champion by Captain Baldwick of the Army Air Corps, this Service is again represented in this year's National Air Races, an Auster 6 being flown by Sgt. R. W. Bowles.

Entrants for the National Air Races at Cardiff at the time of going to press comprised the following, with pilot, entrant (or single name where these are the same), aircraft, registration and racing number:—

Class I, The Air League Challenge Cup.—R. R. Paine, Miles Hawk Speed Six, G-ADGP, 96; G. P. Watson, Proctor 3, G-AOEJ, 63; G. C. Morgan, Miles Gemini 1a, G-AKDD, 79; E. Crabtree, Miles Gemini 3c, G-AKEG, 85;

Top to bottom, last year's British Air Racing Champion was an Army pilot flying an Auster 6, which is represented again this year. Last aired publicly during the 1959 Arch-to-Arc race, the two-seat Spitfire 8 trainer is again being flown by Vivian Bellamy in the London-Cardiff event. New to the racing field is the veteran Fairey Fulmar, which is being flown from its home base at White Waltham by John Fairey.

J. E. G. Appleyard, Chilton D.W.1a, G-AFSV, 10; P. G. Masefield, D.H. Chipmunk, G-AOTM, 62; A. S. K. Paine, Proctor 1, G-AHNA, 65; A. J. Spiller, Proctor 3, G-AHEK, 64; P. Blamire, Gemini 3c, G-ALZG, 80; J. S. Fairey, Fairey Fulmar, G-AIBE, 97; K. B. Neely, Proctor, 67; G. Knox, Cessna 210, 93; J. P. Tyszko, Cessna 310, 95; V. H. Bellamy, Spitfire Mk. 8, G-AIDN, 99. **Class II, The Norton-Griffiths Challenge Trophy.**—Sqn. Ldr. J. de Milt Severne, H.R.H. The Duke of Edinburgh, Turbulent, G-APNZ, 7; D. M. Hartas, Jodel D.117, G-APOZ, 23; J. Stewart-Wood, Auster Mk. 5, G-AIKE, 34; C. Boddington, A. J. Linnell, Comper Swift, G-ABUS, 41; Miss J. L. Ferguson, Turbulent D.31, G-APMZ, 12; W. H. Bailey, S. M. Aarons, Hawk Trainer 3, G-AIUA, 43; C. P. Francis, Turbulent, G-APZZ, 2; G. Rees, Prentice, G-AOPL, 58; Miss J. H. Short, Turbulent, G-APIZ, 9; N. H. Jones, Turbulent, G-APVZ, 4; Miss M. MacKellar, N. H. Jones, Turbulent, G-APBZ, 8; J. F. Underwood, Hampshire Aeroplane Club, Currie Wot, G-APWT, 25; C. W. Hubbard, Prentice Series 1, G-AOLP, 59; Sgt. R. W. Bowles, Auster Mk. 6, VF 544, 36; J. H. Denver, Auster J/1N, G-AJEH, 17; M. L. Brewer, Auster Autocrat, G-ADHK, 35; Wg. Cdr. R. H. McIntosh, Cessna 175, G-APYA, 38; D. W. Phillips, P. A. T. Garland, Garland Linnet, G-APNS, 46; C. Gregory, Taylorcraft Plus D, G-AHGZ, 5. **Class III, The de Havilland Tiger Moth Challenge Trophy.**—C. A. N. Bishop, D.H. Tiger Moth, G-ACDC, 21; J. M. Donald, D.H. Tiger Moth, G-ANZU, 20; P. G. Statt, Sqn. Ldr. H. A. G. Smith, D.H. Moth Minor, G-AFOZ, 31; J. Piercy, D.H. Hornet Moth, G-ADNB, 47; Dr. E. D. Fox, D.H. Tiger Moth, G-APRA, 28; L. J. Benjamin, D.H. Tiger Moth, G-AOAA, 14; C. E. Elton, D.H. Tiger Moth, G-ARAZ, 18; W. P. Meynell D.H. Tiger Moth, G-ANEL, 30; Miss S. Scott, Jackaroo, G-APAM, 52; J. W. C. Judge, D.H. Hornet Moth, G-AEWY, 15; G. C. Marler, Jackaroo, G-APAP, 53; B. J. Snook, D.H. Tiger Moth, G-ANZZ, 22; G. M. Cosett, Tiger Moth, G-AOCV, 24.



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Personal Flying

AS in the U.K., import restrictions have been lifted in Australia for foreign light aircraft, and the influx of American types has been brisk. During 1959, the Australian Cessna agents, Rex Aviation Pty., Ltd., sold 47 new aircraft in the Commonwealth, to become the second leading export distributors for that company. Their sales comprised four Model 150s, nine 172s, 12 175s, 15 180s and seven 182s.

In the first few months of this year, more than a dozen deliveries have included a Cessna 310C for the Department of Civil Aviation, and one of the new 210s.

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In South Africa, the Government has refused to grant a private flying subsidy for the coming year. The Aero Club of South Africa had requested £30,000 for this year's subsidy, but although it had been publicly stated by the Minister of Transport that £20,000 would be granted, no money is now to be forthcoming for the clubs.

For the past five years, £25,000 had been granted annually, and the number of flying training schools in the Union had increased to 23. Many new aerodromes had been built in rural areas, and there was an encouraging revival of flying in outlying districts. The loss of the subsidy is naturally regarded very seriously by the Aero Club of South Africa.

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● Among the latest items of club news is included a report from the Air Touring Club, to the effect that its Autocrat has completed its first year at Biggin Hill with a grand total of 400 hours' flying. Despite the high cost of operation compared with Croydon, flying rates have been maintained at £3 an hour at week-end and £2 15s. mid-week. Recent first solo flights were achieved by Miss M. Culbert, "Doc" Dreelin and Mr. C. Mackintosh. A second Autocrat is now being obtained for club use.

● At its recent A.G.M., the Edinburgh Flying Club reported total flying hours for 1959 of 287 for the Tiger Moth and 106 for the four months of Chipmunk operation. A further 11 hours were flown on a hired Chipmunk. The Chipmunk target for 1960 is well over 700 hours, the break-even figure for the two aircraft being 600 hours.

A new club committee was elected, Jim Merrills becoming chairman. Air Traffic Control at Turnhouse is reverting to the M.o.A. from July 1, after 13 years of R.A.F. administration, and will be accompanied by the establishment of a Control Zone around the airfield.

● The new civil control tower is nearly complete at Biggin Hill, where the Surrey and Kent Flying Club operates, and will soon be in operation. A new system of airfield rules will soon be published, and will include right-hand circuits, so special attention must be paid to the signals square. One of the club's new Prentices has arrived, and the rate for its solo flying has dropped to £6 10s. an hour.

● From the Tiger Club comes detailed results of its two aerobatic competitions so far held this year. The de Havilland Trophy was won on April 16 by Charles Boddington, with John Ayres second, followed by John Wardley and Peter Phillips. Two days later, the Esso Tiger Trophy was also won by Charles Boddington, with 284 out of a possible 300 marks.

YEOMAN SERVICE.—Developed from the Wackett Trainer, with new wings and a 250 b.h.p. Lycoming engine, the Yeoman YA-1 Cropmaster has completed its test programme for agricultural operations in Australia. Five other YA-1s are in various stages of assembly.

Gliding Notes

by Dr. A. E. Slater

AT Fairwood Common, the Municipal Airport of Swansea, on Sunday, May 15, Mr. G. W. Davies, the subscription secretary, was leaning against the Swansea Gliding Club's new T-21b. He had finished his sandwiches some time back, and was awaiting the return of the rest of the party from their Sunday midday dinner.

The club was formed in December, 1958, just in time to get a loan from the Kemsley Flying Trust; but the T-21 had to be bought with a loan from "a local industrial company" which, curiously enough, wishes to remain anonymous. There is also a T-31 two-seater Tutor under renovation, a single-seater Tutor which is little used because the few members who can fly solo are busy training the rest of the 70 flying members, and a spare Tutor fuselage.

A nucleus of the keener members duly arrived, headed by the club chairman Mr. F. H. Abraham, who got down to instructing once more; the retrieving car (cost, £2 10s.) was started up with a downhill push, and the tractor (given free by an interested garage proprietor) towed the winch farther north to give a longer launching run, by special permission of the traffic controller.

The winch has been put together by two members who can be guaranteed to re-start it with minimum delay if it packs up; but when it did so late in the afternoon, they were unfortunately absent. Nevertheless, this winch had been responsible for 110 launches over the Easter holiday alone.

However, the club's intention is to use auto-towing along the runways in the near future, now that a new traffic controller has been converted to the idea by the chairman's persuasive tongue. As to possible aerial congestion, there was no sign of it during my visit. A few light aeroplanes were flying circuits of several miles diameter, and no airliners came within sight or earshot.

West Wales Gliding Association, as the gliding club at Swansea calls itself, is in the typical state of a young gliding club working up towards a promising future, and has obviously a very capable nucleus of people running it, headed by an experienced chairman who, when in the R.A.F., was in charge of gliding for some years at St. Athan.

Fairwood Common is near the middle of the Gower Peninsula, which is naturally surrounded by sea and is, no doubt, liable to incursions by sea breezes from the south-west; but any winds from the E.N.E. will have travelled over three or four miles of Swansea's built-up area. On Apr. 23, when aero-tows were laid on for the first time, a private owner with a Skylark 2 soared in thermals coming up from Swansea and Port Talbot for 1½ hours.

An alto-stratus overcast spoilt the thermals when I was there, but Mr. Abraham had contacted them the week before. Wave clouds have been seen over the site, caused by the mountains to the north, and some members look forward to expeditions to the Black Mountain when there are enough experienced pilots to make use of it.

• • •

THE only other gliding club in Wales, the Precelly Gliding Club of Pembrokeshire, is rather a different proposition. Two or three years ago I related here how they had picked up two Kirby Cadets cheaply from the Air Ministry and left them out in the open. Their latest acquisition is a pair of ancient Falcon 3 two-seaters.

Two experts from the Swansea club were asked over to inspect the Falcons and pronounced them quite unairworthy.

This new Italian standard class sailplane, the EC 39 "Uribel" is being tested at Bresso, the Milan Gliding Club's site, by L. Brigliadori, who will fly it in this year's World Gliding championships, which open June 3.

Over 800 test ejections with both dummy and live subjects have been made in developing the Martin-Baker ejection seat during the past 16 years. This has resulted in the finest item of aircrew escape equipment in production today.

The photograph shows the Hunter T Mk. 7 modified for ejection seat testing, being prepared for another ejection test at the Company's airfield.

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Correspondence

The Lilbourne Circus

TURNING out some old papers recently I came across a diary I had kept during my flying training in the then newly formed R.A.F. at Harling Road aerodrome in Norfolk just prior to the Armistice in 1918. In it I found this entry:—

"Oct. 21st. At the moment the Lilbourne 'circus' of trained Avros is visiting us. This is a course of instruction in aerial fighting and the stunts done are marvellous."

Can anybody tell us more about the "Lilbourne circus"? I have forgotten all about it but the diary mentions that one of its members was a Lt. Clowes.

Ruislip, Middx. E. C. CHEESMAN.

[Lilbourne was a grass aerodrome on Watling Street, not far from the present site of the Hillmorton Radio Station. During the 1914-18 War, boys from Rugby School were frequent—if unauthorized—visitors.—ED.]

Vindicating the Chief Designer

I WENT to see the film "Cone of Silence" and thought it an excellent film, the air photography being particularly well done.

But, having been in the aircraft industry on the technical side for 30-odd years, I thought the portrayal of the chief designer quite out of character. First, I cannot imagine a chief designer or technical director wandering about a new aeroplane on a test flight. Secondly, I cannot imagine he would carry about a first sketch of the aeroplane on a scrap of paper and show all and sundry on the least provocation. Thirdly, I would not think he would be so rude to a test pilot when asked a technical question after a test flight.

(I am not a chief designer.)

London, S.W.3. W. H. SHEPHERD.

Shuttleworth Collection

WITH reference to the above collection of aircraft stationed at Old Warden, Beds, could you please tell me if the general public are able to inspect same, and if so the times, etc. I am unable to find the information locally and would be obliged if you could help.

Stevenage, Herts. D. N. LAWSON.

[It is necessary to write to the Warden Aviation and Engineering Co., Ltd., Old Warden Aerodrome, nr. Biggleswade, Beds, for an appointment to see this exhibition (s.a.e. please!). The collection is normally open for view between 9-12.30 a.m. and 2-5 p.m. weekdays, 9-12.30 a.m. Saturdays and closed on Sunday all day. There is no cost for admission, but a contribution towards the maintenance of the aircraft is always welcome.—ED.]

Spanish Gliding Vacancies Filled

WITH reference to "Gliding Notes," by Dr. A. E. Slater, in your edition of May 13, I write to inform you that although the British Gliding Association was indeed informed by this office that there would be seven vacancies for British gliding enthusiasts, it was stated in a later paragraph of the same letter that many applications to glide had already been received, some of which dated back to last year.

The British Gliding Association were also requested to circularize their affiliated clubs with this information, and to explain that all successful applicants would be informed by this office.

It would be very much appreciated if, through the medium of your column, you could inform your many readers that all vacancies have been filled for this year.

Madrid. JAMES WOOD, Commander, R.N.

WORKING DRESS?—New uniforms have been designed for the 800 B.E.A. stewardesses. The design has been selected from a possible 12 submitted by the R.C.A. School of Fashion Design. The uniform consists of a semi-fitted hip length jacket, high-buttoning to the neck, with a wide collar and straight skirt with a single pleat at the back. The costume and hat are in a tiny blue-black check worsted material. A correspondent has suggested that a pleated skirt and fitted jacket would be both smarter and more practical.

Groundabout

With reference to your reference . . . The Royal Observer Corps needs recruits. If you are interested, write to the Air Ministry for the leaflet 8/58 E6543/6906 Wt.40855-P4140 75M 3/59 Gp.8 F. & C. Ltd. Inf.255/2/59. In the remaining space it tells you all about the Corps.

*

My kind of arithmetic. The Australian correspondent of a Middle East journal seems to have little faith in the Oriental ability to grasp our peculiar Western mathematics. This, he says, is the situation down under: "TAA has for some months now secured 55% of all the airline business in Australia, which means it has more than Ansett-ANA."

*

Feet on Ground. An eager Newcastle reader tells of a grievous disappointment. Seeing an advertisement headed "THESE 504 K SPECIALISTS HAVE YOUR OWN PERSONAL FITTING" he thought hopefully that Avro's were re-issuing the classic old trainer in cheap made-to-measure kits. Alas, the 504 listed shops were foot-measurers for K shoes. Oh, well, back to the Turbulent and the Nipper.

*

Load of Trouble. There are certainly some queer jobs in the airline industry. B.O.A.C. recently advertised for an "Assistant to Mishandled Load Officer," a title which smacks vaguely of one whose work of loading is never quite understood by the Management. ("Dilworth, why didn't you get that load of snowshoes off to Bahrein yesterday? You *did*? Oh, sorry.") And then there are the neighbours—"Jim's got a new job—Mishandled Load Officer—no, it's not *him*, it's the *load* that's mishandled — such a shame. . . ."

*

There's talk of using helicopters to control London's traffic jams. Then balloons to control the helicopter jams. Then airships . . .

by Gordon

Industry Record

Aviation Interest at Olympia

Last week the third International Instruments, Electronics and Automation Exhibition was staged in London at Olympia. Double the size of the last I.E.A. show, held in 1958, this year's exhibition occupied two of the main halls and contained nearly 500 exhibitors from 15 countries.

In addition to a number of exhibits illustrating the application of aeronautical developments to industry in general, the show included both ground and airborne aviation products. These ranged from test equipment to operational control units for aircraft and guided missiles.

Flight recorders were shown by a number of exhibitors for different applications. The CMM 400 range of Midas flight recording and playback equipment was on the stand of Royston Instruments; Ampex exhibited their AR-200 airborne analogue recorder, and the Ministry of Aviation's stand included compact recording equipment produced by R.A.E. for use in both missiles and aircraft.

The R.A.E. missile-borne equipment consists of an eight-track recorder and a variety of encapsulated units, employing transistors, from which a measuring system can be assembled. Designed to withstand severe missile environments and to permit recovery of the tape, the recorder has an armoured casette containing approximately 100 ft. of ¼-in. wide magnetic tape driven at a predetermined speed of 3¾ or 7½ in./sec. The aircraft recorder is designed for flight testing and accommodates 1,800 ft. of 1 in. tape driven at a speed of 1⅞, 3¾ or 7½ in./sec.

* * *

Boulton Paul Aircraft mainly concentrated their exhibits on the electro-mechanical aspects of aircraft control and the accurate measurement of physical quantities by electronic means. In the former category, specimens of the powered flying control units fitted in the Avro Vulcan and the Blackburn N.A.39 illustrated the trend towards economy in bulk and weight and the design of units to fit into restricted spaces.

Among exhibits shown by the aircraft group of The Plessey Co., were control systems incorporating magnetic indicators for signalling remote information, various sizes of relays and a range of miniature circuit breakers. A sensitive temperature control device, originally developed for windscreen de-icing, was also demonstrated as a means of protecting force-cooled electronic equipment from blower failure.

* * *

Ultra Electronics displayed their recently developed engine condition analyser. Displaying visual information on engine temperature and vibration, it can be employed for continuous monitoring in flight, for pre-flight checks and enables routine maintenance fault location to be undertaken without external equipment. Comprising two units, a scanner for mounting in the equipment bay and a display unit for the flight deck, the analyser has 40 thermocouples for temperature measurement and eight vibration transducers.

Computers at Olympia included a new small capacity general purpose analogue equipment named Simlac Minor. Shown by Short Brothers and Harland, it has a greater capacity than is available in the company's 18-amplifier general purpose computer, but does not have the capacity or higher accuracy of the recently announced Simlac computer. The entire instrument is housed in two 19-in. Post Office type racks. Another computer demonstrated was the English Electric Lace Mk. 2 developed for aircraft and guided missile design studies.

* * *

The instrument wing of the English Electric Aviation guided missile division exhibited a miniature integrating gyroscope mounted on a simple rotary test table undergoing a polar axis tumbling test. A single degree of freedom floated instrument, this type of gyro has been designed for use in short-term inertia systems, centrally stabilized reference systems in conjunction with Doppler navigation and similar applications. Another exhibit on this stand was a floated rate gyroscope primarily developed for missile control.

A new piece of equipment at the show was a lightweight contact printer designed by Fairey Air Surveys, Ltd. Small and light enough for transportation in the smaller types of air survey aircraft, it has four 15-w. bulbs for illumination, which are controlled by a rheostat for adjusting for both bromide and chloride papers.

The recently announced de Havilland electronic flowmeter was also demonstrated by a working model. Known as the Pottermeter, it has an hydraulically positioned bearingless rotor and is suitable for use with any liquid. It can be supplied with digital indicating, recording and/or control equipment.

The Grand Hall, Olympia, during the I.E.A. Exhibition.

Aviation Calendar

Jne. 3

Cardiff.—London—Cardiff Air Races, organized by the Royal Aero Club, at Rhoose Airport, and Jne 4.

Jne. 4

Butzweiler (Cologne).—World Gliding Championships, organized by the German Aero Club; until Jne. 18.

Jne. 5

Fréjus.—International Provençal Wine Rally, organized by the Fréjus-St. Raphaël Aero Club; until Jne. 6.

Rheims.—International Rally, organized by the Champagne Aero Club.

Jne. 6

Hucknall, Notts. — R.A.F.A. Air Display, Hucknall Aerodrome, at 14.30 hrs.

Jne. 8

London.—Kronfe'd Club fi'm show, "Antarct'ca Crossing," in the Basement, 74 Eccleston Square, S.W.1.

Jne. 10

London.—R.Ae.S. Rotorcraft Section lecture, "Helicopter Vibration," by Dr. J. P. Jones, in the Library, 4 Hamilton Place, W.1, at 18.00 hrs.

Cranfield.—College of Aeronautics Open Day; and Jne. 11.

Jne. 18

Angers.—14th International Wine Rally. "*Fleurs et Châteaux d'Anjou*," organized by the West Aero Club of France.

Jne. 20

Athens.—NATO AGARD Ionospheric Research Committee Meeting, "Radio Wave Absorption"; until Jne. 23.

Jne. 25

Staverton Aerodrome.—Air Show, organized by Cheltenham and Gloucester R.A.F. Association, at 15.00 hrs.

Escoublac, la Baule.—Invitation Air Rally for Members and Associate Members of the Royal Aero Club; until Jne. 27.

New Patents

APPLICATIONS ACCEPTED

840,991.—**General Precision Systems, Ltd.**, formerly Air Trainers Link, Ltd. (Link Aviation Inc.).—"Flight computers."—Apr. 15, 1958.

841,211.—**Vyzkumny a Zkusebni Letecky Ustav.**—"Apparatus for the stabilization of helicopters."—Jan. 16, 1957.

841,077.—**Quilter, Sir, J. R. C.**—"Pack parachutes." Sept. 8, 1958. (Sept. 9, 1957.)

841,099.—**Garrett Corporation.**—"Inflatable and deflatable supports."—Oct. 24, 1958. (Oct. 25, 1957.)

841,450.—**Triggs, W. W. (Wingfoot Corporation).**—"Inflatable mat structure."

841,110.—**Rolls-Royce, Ltd.**—"Jet propulsion nozzle arrangement."—Mar. 11, 1958. (Mar 13, 1957.)

841,320.—**Rolls-Royce, Ltd.**—"Engine mountings." Apr. 5, 1957. (Apr. 9, 1956.)

Printed specifications available on Jly. 13, 1960; opposition period expires on Oct. 13, 1960.

840,068.—**Amio Inc.** (Grieger, T.H.).—"Instruments for detecting ice conditions of the atmosphere."—Feb. 18, 1958.

840,139.—**Specialities Inc.**—"Systems for indicating a variable condition of an aircraft."—May 5, 1958. (May 6, 1957.)

840,427.—**Ferranti, Ltd.**—"Aircraft navigational apparatus."—Mar. 15, 1957. (Apr. 3, 1956.)

840,509.—**Fairey Co., Ltd.**, formerly Fairey Aviation Co., Ltd.—"Aircraft de-icing installations."—Jly. 15, 1958. (Apr. 15, 1957.)

840,277.—**Doman Helicopters Inc.**—"Helicopter rotor head combination with mechanism to fly rotor level."—Nov. 28, 1957. (Dec. 27, 1956.)

840,622.—**Soc. d'Applications des Machines Motrices.**—"Servo-controls."—Jan. 18, 1957. (Jan. 18, 1956.)

840,626.—**Rolls-Royce, Ltd.**—"Control means for aircraft."—Jan. 17, 1958. (Jan. 25, 1957.)

840,679.—**Fairey Co., Ltd.**—"Helicopters with jet-driven rotor blades."—Apr. 16, 1958. (Apr. 23, 1957.)

840,555.—**Gotex A.B.**—"Rotary wing parachute devices."—Dec. 31, 1956. (Dec. 31, 1955.)

840,540.—**Zelm, van W. D.**—"Energy absorption unit."—Apr. 18, 1958. (Feb. 17, 1958.)

Printed specifications available on Jly. 6, 1960; opposition period expires on Oct. 6, 1960.

Personal Notices

BIRTHS

Daniels.—On May 19, at Leanchoil, Forres, Moray, to Audrey, wife of Flg. Off. B. A. Daniels—a daughter.

Elton.—On May 16, at 25 Grenville Road, Padstow, to Elizabeth (*née* Stuart), wife of Flt. Lt. P. J. G. Elton—a daughter.

Kendal.—On May 6, at Battle Hospital, Reading, to Elizabeth (*née* Sellick), wife of Flt. Lt. Spencer Kendal—a daughter.

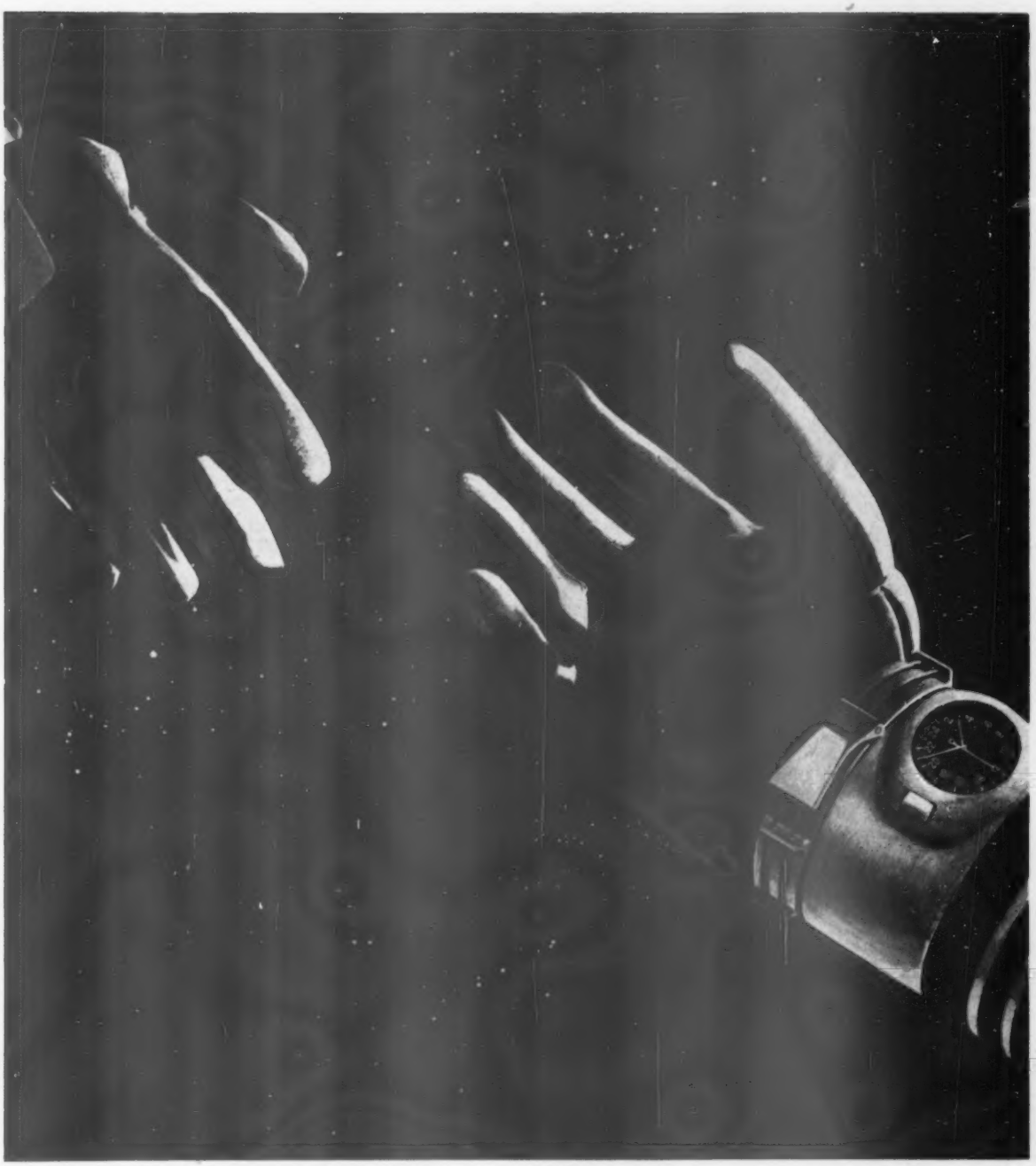
Mellish.—On May 14, at Nocton Hall, to Pamela (*née* Brown), wife of Flt. Lt. P. J. Mellish—a son.

Phibbs.—On May 15, at R.A.F. Hospital, Ely, to Anne (*née* Drinkwater), wife of Flt. Lt. M. P. Phibbs—a son.

Collins.—On May 22, at Rochford, to Jo (formerly Grimaldi), wife of Bernard Collins—a son.

MARRIAGE

Steed-Dunn.—On May 21, at St. Clement Danes, Flt. Lt. Richard John Steed, to Gloria Dunn.



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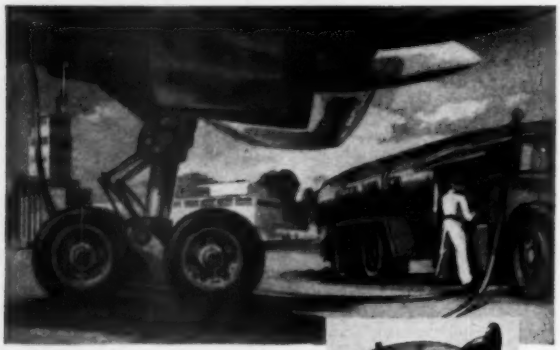

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Bottom left is the Fuel Monitor, designed in conjunction with the Shell Petroleum Company Ltd. This is a fully "fail-safe" device, consisting of a valve and a water sensitive element, continuously sampling the flow of fuel and causing the main valve to close if water contaminated fuel is revealed.

Bottom right is the high-output MC filter, giving what is for many purposes an acceptable filtration efficiency at a much higher rate than the K type.

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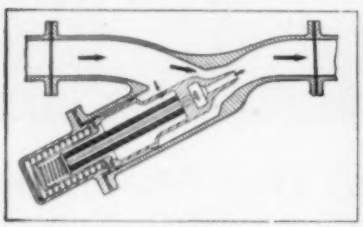

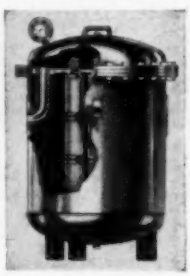

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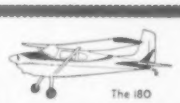

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THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM STARWAYS, LTD., OF LIVERPOOL AIRPORT, LIVERPOOL, 24:—

APPLICATION NO. 353/3 for an amendment to the terms of approval of the U.K. Internal Service which they are authorized to operate between Liverpool and London Airport with Dakota aircraft at a frequency of 15 return flights weekly (or with one DC-4 flight in place of any two Dakota flights), until October 31, 1961, so as to enable them to operate at an increased frequency of 25 return flights weekly.

FROM B.K.S. AIR TRANSPORT, LTD., OF BERK HOUSE, BAKER STREET, LONDON, W.1, for the following Normal Scheduled Services, for the carriage of passengers, supplementary freight and mail, at a frequency in accordance with traffic demand on each service, for 10 years from the opening date of Cork Airport:—

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APPLICATION NO. 3530, with Dakota and Ambassador aircraft, between Newcastle and Cork.

FROM OVERSEAS AVIATION (C.I.), LTD., OF 6 YORK STREET, ST. HELIER, JERSEY, C.I., for seven years from 1960:—

(a) For the following All Freight Services, unless otherwise stated with Viking and Bristol 170 aircraft, at an initial frequency of three return flights weekly on each service, increasing later in accordance with traffic demand:—

APPLICATION NO. 3531 on the route Manchester-Hamburg and/or Bremen-Malmo.

APPLICATION NO. 3532 on the route Manchester-Amsterdam-Dusseldorf-Frankfurt.

APPLICATION NO. 3533 on the route Manchester-Birmingham-Guernsey-Jersey.

APPLICATION NO. 3534 with Viking aircraft only on the route London (Gatwick)-Nice, Malta, at an initial frequency of one return flight weekly, increasing later in accordance with traffic demand.

APPLICATION NO. 3535 on the route London (Gatwick)-Frankfurt-Munich-Vienna, at an initial frequency of six return flights weekly, increasing later in accordance with traffic demand.

(b) APPLICATION NO. 3536, for a Vehicle Ferry Service with Bristol 170 aircraft, for the carriage of vehicles and associated passengers, incidental passengers and supplementary freight, between London (Gatwick) and Luxembourg, at an initial frequency of six return flights weekly increasing later in accordance with traffic demand.

(c) For the following Normal Scheduled Services unless otherwise stated with Argonaut and Viking aircraft at an initial frequency of two return flights weekly on each service increasing later in accordance with traffic demand, for the carriage of passengers and supplementary freight:—

APPLICATION NO. 3537 between London (Gatwick) and Ostend.

APPLICATION NO. 3538 between London (Gatwick) and Antwerp.

APPLICATION NO. 3539 between London (Gatwick) and Rotterdam.

APPLICATION NO. 3540 with Argonaut aircraft only, at an initial frequency of one return flight weekly increasing later in accordance with traffic demand on the route London (Gatwick)-Tetuan-Casablanca-Porto Santo.

APPLICATION NO. 3541 between Liverpool-Dinard, from May to October each year.

APPLICATION NO. 3542 on the route Liverpool and/or Birmingham-Luxembourg.

APPLICATION NO. 3543 on the route London (Gatwick) and/or Liverpool-Shannon.

APPLICATION NO. 3544 between Birmingham and Geneva, from May to October each year.

APPLICATION No. 3545 with Argonaut aircraft only, on the route Birmingham-Munich-Rimini (opt.).

APPLICATION NO. 3546 with Argonaut aircraft only, for the carriage of passengers, supplementary freight and mail between Manchester and Nice, from April to October each year.

These applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the application may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections.

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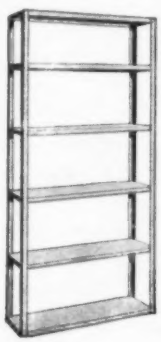

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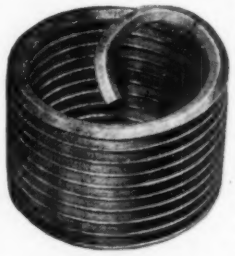

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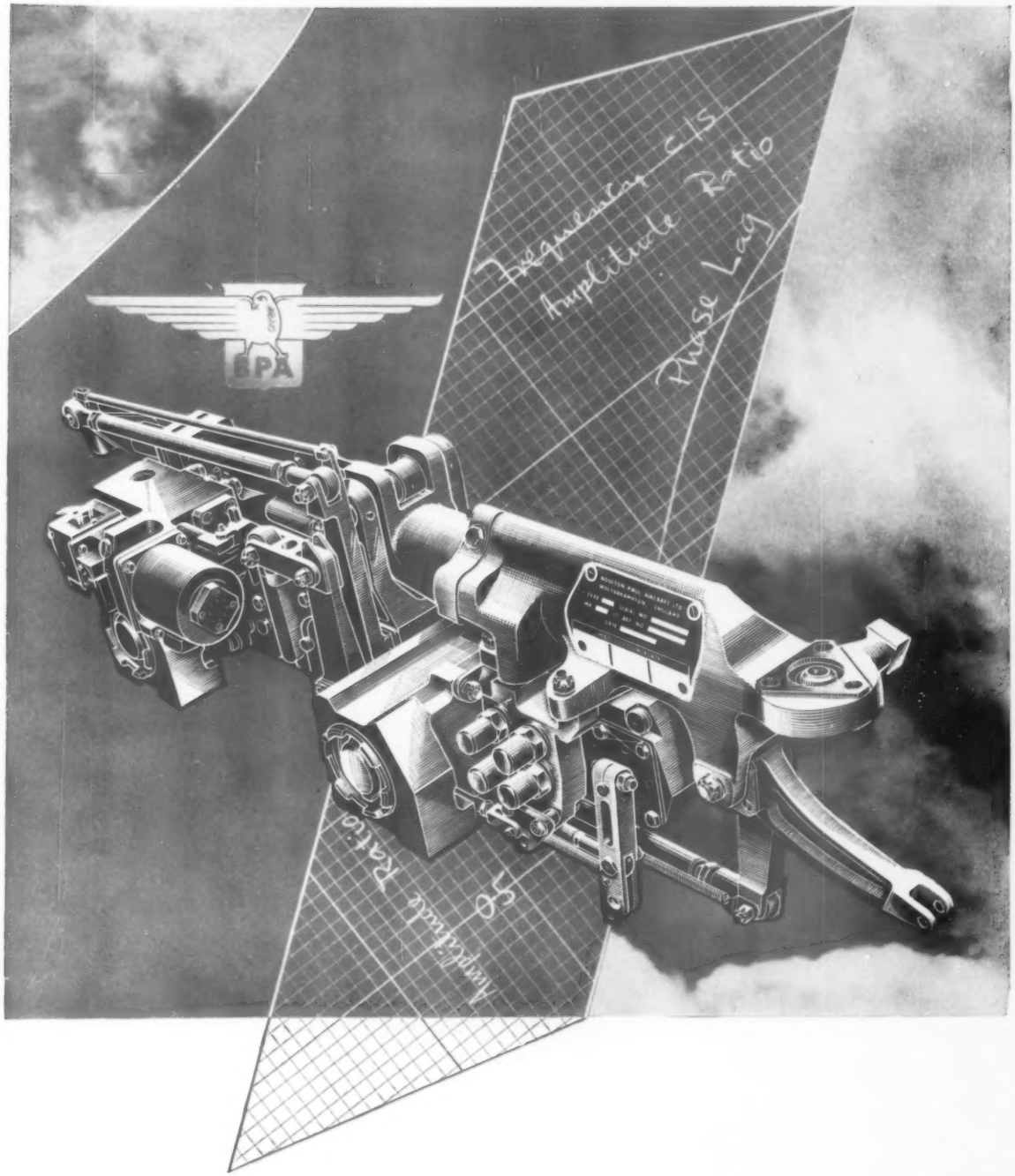

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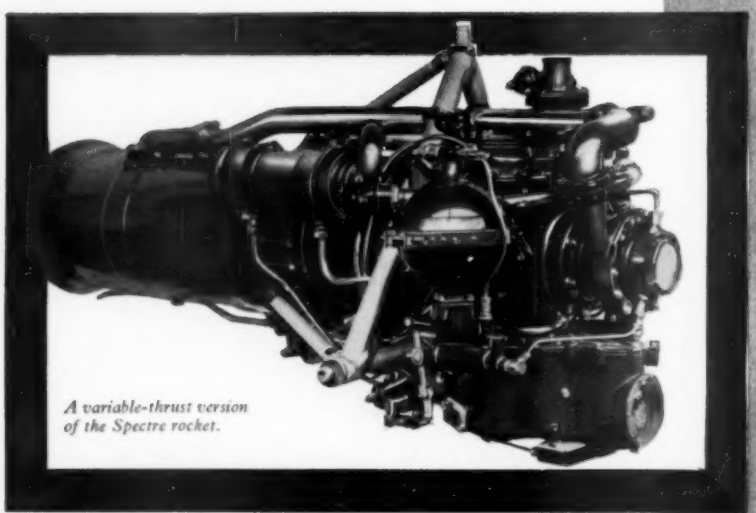

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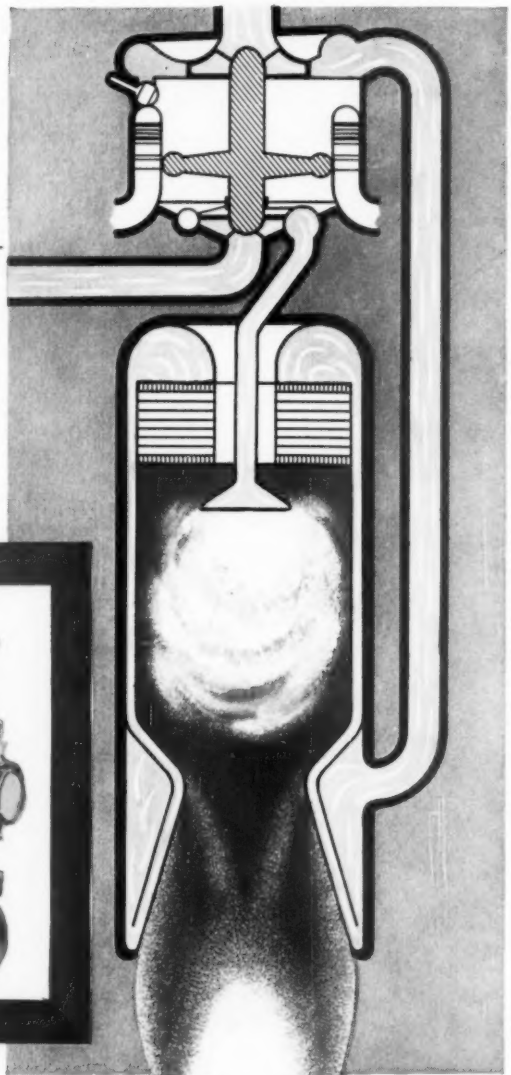

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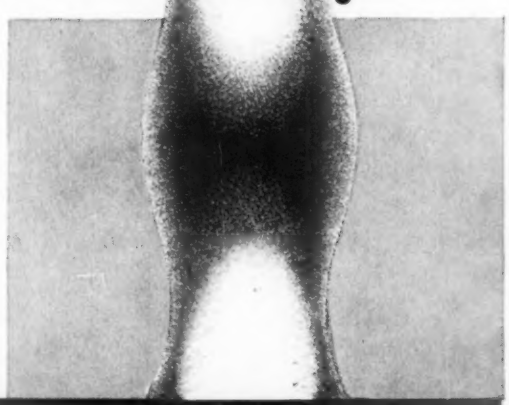

* Used for the moving blades of every British gas turbine

TGA 111